DOCUMENT RESUME

ED 022 508 LI 000 971

REQUIREMENTS STUDY FOR FUTURE CATALOGS. PROGRESS REPORT NO. 2.

Chicago Univ., Ill. Graduate Library School.
Spons Agency-National Science Foundation, Washington, D.C.
Report No-NSF-GN-432
Pub Date Mar 68
Note-224p.
EDRS Price MF-$1.00 HC-$9.04
Descriptors-*BOOKS, CATALOGING, *CATALOGS, DATA ANALYSIS, *INFORMATION RETRIEVAL, LIBRARY COLLECTIONS, *MEMORY, OPERATIONS RESEARCH, RESPONSE MODE, *SEARCH STRATEGIES

This volume contains reports of the findings of the book-memory experiment, designed to measure certain impressions persons retain after a single examination of a book. The research reported here is designed to provide evidence of the relative memorability of various descriptive characteristics of books. Characteristics investigated include several now utilized in descriptive and subject cataloging as well as various characteristics not commonly thought to be significant either for catalog records or for retrieval strategies. The primary objective of this phase of research is to identify those characteristics of books which are often enough remembered to be of potential use as retrieval clues. Such knowledge could then play an important role in design studies of future catalogs. The relative usefulness of various types of nonstandard book information for retrieving a specific work was determined and is presented in tabular form. The other significant research finding was that providing the average specific work requestor with an appropriate retrieval system to exploit his nonstandard information could reduce his expected search effort by a ratio on the order of 500 to one. Appendices include materials used in testing and the numerical data from the experiment. (Author/JB)

LI 000971

# REQUIREMENTS STUDY FOR FUTURE CATALOGS

Progress Report No. 2
March 1968

National Science Foundation Grant GN 432

THE UNIVERSITY OF CHICAGO · GRADUATE LIBRARY SCHOOL

LI 000971

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

THE UNIVERSITY OF CHICAGO

GRADUATE LIBRARY SCHOOL

# REQUIREMENTS STUDY FOR FUTURE CATALOGS

(National Science Foundation Grant GN 432)

ED022508

PROGRESS REPORT NO. 2

March, 1968

TABLE OF CONTENTS


Page

Acknowledgment . . . . . v

Personnel . . . . . vii

Project bibliography . . . . . ix

1. Memorability of Book Characteristics: An Experimental Study . . 1

2. Evaluation of Variations in Response Patterns of Psychology and Non-Psychology Students for All Characteristics . . . . . 42

3. Effectiveness of Book-Memory Data for Conventional Catalog Retrieval . . . . . 45

4. Accuracy and Utility of Subject-Related Responses . . . . . 55

5. An Analysis of Non-Exact Title Data . . . . . 64

6. Title, Subtitle, and Table of Contents as Sources of Index Words . . . . . 73

7. The Potential Usefulness of Catalog Access Points Other Than Author, Title, and Subject . . . . . 81

8. Appendices

   A. Materials Used in Exposure and Testing Sessions of Book-Memory Experiment . . . . . 123

   B. Book-Memory Experiment Data . . . . . 153

   C. Comparative Data for Psychology and Non-Psychology Experimentees . . . . . 181

   D. Data Supplement to "The Potential Usefulness of Catalog Access Points Other Than Author, Title, and Subject . . . 197

ACKNOWLEDGMENT

The idea of an experiment to test what people tend to remember about books they have seen (which forms the basis for most of the individual portions of this report) had its origins in conversations I held with George A. Miller during the Intrex Planning Conference in 1965. Professor Miller subsequently visited Chicago and participated in a number of stimulating and productive meetings during the early design stages of the project. Dr. Jerome Cohen (of Northwestern University) served also as a consultant to the project in its early stages; we are indebted both to Dr. Miller and Dr. Cohen for many valuable suggestions.

We are further indebted to the National Science Foundation Office of Science Information Services for the grant which made this work possible.

Don R. Swanson

## PERSONNEL

This study has been carried out by various members of the faculty and student body of the Graduate Library School. Although individual contributions are in part recognized through individual authorship of various sections of the report, on the whole this has been a team effort. Yet the very special and major role played by Professor Cooper and by Miss Delores Vaughan in coordinating the work of the project and analyzing the results deserves particular mention.

Faculty participants and advisors:

Ruth French Carnovsky
William S. Cooper (co-principal investigator)
Frederick A. Schlipf
Don R. Swanson (co-principal investigator)

Student research assistants:

Delores Vaughan, (project leader)
Mary Blackburn
Dorothy Day
Velma Harris
William Hinkley
Eleanor Montague
Neil Radford
Helen Schmierer
Rose Spaith
Carol Woolpy

## PROJECT BIBLIOGRAPHY


Blackburn, Mary. "Information About Books Known By Users of the Catalog Who Are Looking for a Particular Work." Unpublished Master's Dissertation, Graduate Library School, University of Chicago, 1968.

Montague, Eleanor. "Card Catalog Use Studies, 1949-1965." Unpublished Master's Dissertation, Graduate Library School, University of Chicago, 1967.

"Requirements Study for Future Catalogs: Progress Report No. 1." Graduate Library School, University of Chicago, October, 1966. (Mimeographed)

# MEMORABILITY OF BOOK CHARACTERISTICS: AN EXPERIMENTAL STUDY

Delores K. Vaughan

## Introduction

If library catalogs had not existed for hundreds of years, and it were suddenly realized that a device for recording the contents of library collections was desirable, how might the designers of the projected catalog proceed to develop specifications for their product?

The considerations necessary to catalog development are first, to define the functions a library catalog would be expected to serve, next, to establish performance requirements it should meet, and finally, to develop a design to meet these requirements.

An expected function of a catalog is that it be a finding device--that it provide its users with the means of identifying and locating desired materials represented in the catalog. Moreover, one expects that the catalog will be utilized as a finding device in at least two ways: (1) by a patron who wishes to locate any appropriate materials available in the library on a particular subject or by a particular author, and (2) by a patron who desires to locate a specific work which he knows to exist--possibly one with which he has had previous contact.

Let us concentrate on the last instance--the patron who, having had previous contact with a particular book, wants to locate it in the catalog. How can the catalog provide him with access to the desired book? At this point we observe that present library catalogs provide access to books through three primary means of approach: author, title, and subject headings. Usually, a patron searching for a particular book needs accurate knowledge of at least one of these three in order to locate the book in the catalog. From the patron's point of view, however, an ideal catalog would allow him to utilize any information he could supply about

a particular book. He would not be dependent solely upon the traditional approaches, and thus would have a better chance of locating the book he sought.

The introduction into library technology of computerized information handling systems affords opportunities for increasing catalogs' efficiency as finding devices. Automated systems could allow multiple coordinate searching on a number of information fields, or approaches--a procedure which is impractical, if not impossible, with alphabetically arranged card catalogs. Thus a library patron desiring to retrieve a particular book might thus be able to interrogate an automated catalog with whatever fragmentary information he could provide.

Important questions facing catalog designers are (1) what kinds of information are library patrons likely to be able to recall about books they have previously seen, and (2) how useful would such information be in a retrieval system. Catalog use studies seem to be of little value in exploring these questions, since the information library patrons bring to present catalogs is conditioned by their expectation of catalog capabilities.

An investigation of these questions has been conducted by faculty and students of The Graduate Library School, University of Chicago, supported by the National Science Foundation. The present set of reports concerns the findings of an experimental study, the book-memory experiment, designed to measure certain impressions persons retain after a single examination of a book. The research reported here is designed to provide evidence of the relative memorability of various descriptive characteristics of books. Characteristics investigated include several now utilized in descriptive and subject cataloging as well as various characteristics not commonly thought to be significant either for catalog records or for retrieval strategies. The primary objective of this phase of research is to identify those characteristics of books which are often enough remembered to be of potential use as retrieval clues. Such knowledge could then play an important role in design studies of future catalogs.

## The Book Memory Experiment

### Objective and Scope

The book-memory experiment was designed to partially simulate the condition confronting a library patron who is considering attempting retrieval of a book with which he has had previous experience. Unless he has an accurate written citation, a patron in such a position must probe his memory for whatever pertinent facts about the desired work he can recall. With present catalogs, however, he must ignore facts which he believes will not be useful in retrieving the book: A correct author, title, or subject heading will be his most useful information. The book-memory experiment attempted to eliminate this characteristic mental self-limitation in order to obtain a more accurate representation of the types of information about books that people tend to remember.

Subjects participating in the book-memory experiment, after a brief experience with specific books, were tested on their memory of selected characteristics of those books. Participants' responses to questions regarding the books were evaluated, and evidence of the relative memorability of the various characteristics was gathered. A final assessment of the relative value in retrieval systems of these characteristics cannot be made on the basis of demonstrated memorability alone but is dependent upon factors in addition to the memory data. However, the data gathered from the book-memory experiment and summarized herein is also of interest in its own right.

### Design and Procedure

The book-memory experiment was designed by a research staff of Graduate Library School faculty and students with the consultant services of two academic psychologists. After a pilot study, the experimental phase was conducted at the University of Chicago during the summer and fall of 1966. Materials involved in the experiment included a collection of books gathered for the purpose and various paper-and-pencil testing devices. A self-selected group of volunteers acted as subjects. Each

subject attended two sessions; during the first, he was given exposure to a number of books, and during the second was quizzed about the books he had seen previously.

The experiment was conducted in an office that had been specially equipped for the purpose. Book stacks were installed, and desks were provided and placed so that subjects were unable to look at the book stacks while completing their responses during the testing session.

The experimental book collection consisted of 180 books chosen from the psychology[1] collection of the University of Chicago Library and borrowed from the library for the duration of the project. Occasionally the library requested the return of one or more books; however, these books were kept until any subjects who had used them had completed their testing session. Titles of returned books were subsequently not offered to new subjects for their consideration, since the books were no longer available. The experimental collection was not seriously diminished as a consequence of books' being returned; only about ten books were lost in this manner while the experiment was being conducted. The books used were selected to provide a variety such as might be found in an actual library collection, and an effort was made to provide books representing various form, content, and physical characteristics. The experimental collection was housed in a single seven-foot book stack, in which the books were arranged alphabetically by author. A second or auxiliary book stack, housing a random collection of the same type of books, was used in the experiment to simulate another physical environment during recognition testing.

Subjects for the book-memory experiment were paid volunteers from the University community who responded to an advertisement posted on campus bulletin boards. There was no screening of applicants; all

---

[1]The field of psychology was chosen in order to provide a controlled subject-matter collection, one in which there is a fairly high degree of lay interest, and one in which terminology is not a major deterrent to understanding. It was considered desirable to avoid a wide range of subject matter because of the impossibility of providing a cross-section of book properties in a relatively small collection unlimited by subject.

who responded to the advertisement participated in the experiment. All but ten experimentees[1] were University students, of whom thirty-four were undergraduates and sixty were graduate students. The ten non-students included two University employees, six recent graduates, and two high school students attending a University-sponsored workshop.

During the course of the testing, experimentees were not informed of the objectives of the experiment. The designers of the experiment reasoned that if experimentees began thinking in terms of catalog information, this frame of reference would dictate the types of information they would remember. As a further control for bias, all instructions were standardized and mimeographed; a minimum of verbal direction was given by the examiner. The results obtained appear to confirm the assumption that experimentees were indeed ignorant of the fact that their recall of specific items of information was being investigated: had they desired to perform well, they could easily enough have memorized details such as authors and titles during the exposure session.

A total of approximately three hours' time was required of each experimentee: one hour for the exposure session, and two hours for the testing session. No time limit for the testing session was set; individuals worked at their own pace and varied in the exact amount of time they required to complete the session. Normally only one experimentee was being tested at any one time, and he was alone in the room with the examiner. Overlaps occasionally occurred when an experimentee took an unusually long amount of time and the next scheduled experimentee appeared for his appointment. This caused little inconvenience, and it is not believed that any distraction which may have ensued influenced the experimentee's performance.

---

[1]Hereafter the term "experimentee" will be used to refer to those people who participated in the book-memory experiment; the term "subject" will be reserved for designating the description of books' content, i.e., topic, in the library sense.

Exposure Session

At the first of the two sessions, the exposure session, each experimentee was presented with a mimeographed list of thirty books[1] and asked to place a check mark in front of the ten which appeared to be of greatest interest to him. He was then told to go to the book stack housing the experimental collection, locate the ten books, and take them back to his desk. After a cursory examination of the ten books, he was to assign each a rating, A, B, C, or D, indicating the strength of his interest in the book, and mark that rating on the list. He next chose five of the ten books, examined them more closely, and composed for each a brief comment expressing his reaction. The resultant five comments and the books they represented became the focus of the second or testing session of the experiment.

Experimentees were required to supply written comments on the five books crucial to the experiment in order to provide them later with some kind of purpose for attempting to remember descriptive characteristics of the books examined. That is, if an experimentee remembered having seen a book with a certain title, or of a certain color or size, etc., but remembered nothing about the content of the book or why it interested him, such a recollection would be meaningless--the experimentee would have no motive to remember anything about the book. Thus the comment--the experimentee's own statement of what he found interesting about a particular book--was later used to provide him with a reason for wanting to describe that book.

Testing Session

Two weeks after the exposure session, each experimentee returned for a testing session. This session consisted of two parts: (1) Testing

---

[1]Six different lists of thirty books each were used, thus every book in the experimental collection was offered to some experimentees. A sample copy of one of the lists, together with copies of all other materials used in the book-memory experiment, is included in Appendix A.

of recall of information about the five books perused and commented on, and (2) Testing of recognition of all ten books examined, both by author and title, and as physical objects.

Recall testing was done in three successive stages designed to elicit first spontaneous, then stimulated recall. This was accomplished by first asking the experimentee to volunteer information, and then in the second and third stages providing him with cues to memory.

First, the experimentee was given five blank 5" x 8" cards and asked to reconstruct as accurately as possible each of the five comments he had written and to give as much additional information about each book as he could recall. When he indicated that his memory of the books was exhausted, the second stage was initiated. He was then given five checklists (see Appendix A) which inquired about a number of characteristics that he might or might not have already recalled, or that he might not have considered important. Keeping the cards he had previously written but using a different color pen (in order to provide a visual record of how frequently and during which stages impressions were recorded or altered), he then filled in the checklists with whatever details he was able to supply. He was asked not to change any statements he had made on the cards but write his then current impressions on the checklists, which he numbered to correspond with numbers on the matching cards. At the third stage, the experimentee was given a typed copy of the five comments he had written during the exposure session (edited to remove specific references to author or title) and asked again to supplement the information he had already given if he could do so. He wrote any additional or corrected information on the same checklists used in the previous stage, but used a third color pen. If, on seeing his comments, he recalled books which he had not remembered during stages one and two, he was given additional checklists and he then proceeded to provide information on those books.

At this stage he was also asked to compose a title that would describe the contents of the book and to indicate subject headings he would consult in order to find the book in a library catalog. Unfortunately, this refinement was not added to the original design until after about one-half of the experimentees had completed their testing session. It was initiated because the research staff noted a tendency on the part of

experimentees to be quite unspecific in their description of the subject of a book, thus making any assessment of the quality of subject information elicited extremely tenuous. Thus, there is a distinction between subject descriptions (informal, narrative statements about the contents of the books) and subject headings (estimations of formal catalog entries) supplied in the experiment.

Finally, the experimentee was asked to match the comments that had been returned to him to the written information he had provided for each of the books by numbering the comments to correspond to the cards and the checklists.

Recognition testing was also carried out in three stages: (1) author-title recognition, (2) recognition of the actual books in a different environment, and (3) recognition of the books in their original environment. These stages simulated actual retrieval in that they tested the experimentees' ability to recognize "known" books on a list and in a bookstack among other books.

At the first stage, the experimentee was given a mimeographed list of some 600 books, listed by author and title. The books actually used in the experiment were included in the list, together with several "false leads," and the experimentee was required to identify all ten of the books he had examined, distinguishing those five he had commented on from the other five. At the second and third stages of recognition testing, the experimentee was instructed to locate and remove the ten books from a bookstack, first from an auxiliary stack in which they were shelved at random, and in which he was required to identify the books on the basis of their external appearance alone, and finally from the position in the stack in which they had been located at the time of his first experience with them two weeks previously. At this final stage, the experimentee was allowed to examine the textual material in the books if he wished in order to determine that they were indeed the correct books. At both the second and third recognition stages, he indicated which of the books were those he had commented on and matched the books to the written information he had provided for each.

Classification of Data

One hundred four experimentees were tested, representing a potential yield of 520 sets of book-memory data (104 experimentees x 5 books). As was expected, however, not every experimentee was able to recall all the books he had commented on; some could remember only two or three books; some remembered and produced data on books that they had examined but not commented on, either mistakenly or expecting that the substitution would be acceptable. Thus, a total of 531 sets were collected. A criterion for acceptable data was formulated, and all data sets that failed to meet the criterion were discarded. The criterion was based on the comment requirement: (1) Data sets must have been produced in reference to books for which comments had been written, and (2) During the testing session, the data sets must have been correctly matched to the appropriate comments. The significance of the comment criterion was in ensuring that the experimentee actually had a specific book in mind and could remember it clearly enough to recognize the statement he had previously made about it. Thus, the experimental situation approached a library situation in which a patron wishes to locate a specific book with which he has had previous contact and now wishes to retrieve. Ultimately, 440 eligible data sets were identified.

These 440 data sets, each set representing one experimentee's memory of one book, were further classified in regard to (1) whether or not the experimentee was able to substantially reproduce his comment at the first stage of recall testing,[1] (2) the stage of recall testing during which the data set was begun, and (3) the experimentee's success or failure in the two types of tasks during recognition testing.

Eligible data sets comprise five classes (Classes 1-5) with two types of failures[2] (b, c failures) possible within all but Class 1.

---

[1]This is not the same as the criterion of demonstrated recognition of the comment as belonging with the data set for a specific book. In determing the eligibility, it was not required that an experimentee reproduce his comment, only that he ultimately be able to attach it to one remembered book.

[2]An "a" failure was also defined: The experimentee was unable to match his typed comment to the correct data set. Such failures did not meet the criterion for eligible data.

Classes and failures are defined as follows:

Classes

1 Data set begun at Stage 1 of recall testing; experimentee reproduced comment fairly accurately; no occurrence of any failures.

2 Same standard as Class 1, but one or more failures occurred. Thus Class 2 contains all responses which met Class 1 criteria except for containing b and/or c failures.

3 Data set begun at Stage 1 of recall testing; comment was not reproduced; b and/or c failures possible.

4 Data set begun at Stage 2 of recall testing with checklist; b and/or c failures possible.

5 Data set begun at Stage 3 of recall testing with return of typed comments; b and/or c failures possible.

Failures

b Experimentee was unable to recognize the object book in the original bookstack during Stage 3 of recognition testing.

c Experimentee was unable to recognize the object book on the mimeographed list during Stage 1 of recognition testing.

bc The two above failures in combination.

The 440 data sets were also divided into two groups representing field of academic specialization--psychology, and other disciplines. This categorization was imposed in order to simulate a comparison of the performances of specialists and laymen in the field. Results of this comparison are discussed in "Evaluation of Variations in Response Patterns of Psychology and Non-Psychology Students for All Characteristics," which follows the present paper.

Table 1 shows the distribution of the 440 eligible data sets into classes and failures. It can be seen that over half (243) of all eligible data sets fell into Class 1, the class that presumably contains those responses based on the strongest recall of particular books. It was informally hypothesized that responses in these data sets would evidence the most accurate memory of book properties; however, although memory in some cases was slightly more accurate, it was not greatly so.

TABLE 1

CLASSIFICATION OF ELIGIBLE DATA SETS
(N = 440)

| Class | No Failure | Type of Failure | | | Total |
|---|---|---|---|---|---|
| | | b | bc | c | |
| 1 | 243 | * | * | * | 243 |
| 2 | * | 2 | 8 | 53 | 63 |
| 3 | 42 | 4 | 4 | 17 | 67 |
| 4 | 10 | 0 | 0 | 0 | 10 |
| 5 | 39 | 1 | 6 | 11 | 57 |
| Total | 334 | 7 | 18 | 81 | 440 |

*Cells containing asterisks are empty by definition; other empty cells are those in which no data sets happened to fall.

Analysis of data sets yielded some general observations concerning the nature of experimentees' memory and their conceptual approaches to book characteristics. First, responses elicited during the first stage of recall testing (writing information on blank cards) were usually related to intellectual aspects of books, i.e., subject content and personal reactions, titles and authors; physical and bibliographic features other than title and author were infrequently mentioned. However, if bibliographic or physical features were mentioned at this stage, descriptions were accurate in most cases. Second, it can be seen that the majority--nearly 85 per cent--of books recalled were recalled at Stage 1 (Classes 1, 2, 3). Stage 2 (Class 4), presentation of the checklist, stimulated the recall of only ten books, and Stage 3 (Class 5), return of copies of the original comments, resulted in recall of fifty-seven additional books. Finally, information about bibliographic and

physical characteristics was elicited chiefly during Stage 2 when experimentees filled out checklists.[1] It had been planned to measure the effect of the memory stimuli provided by the checklist and the typed comments, but information provided at Stage 1 was minimal, as were changes made at Stage 3 (with the exception of those fifty-seven respondents who remembered object books only when they saw their own comments on those books--Class 5 responses). Therefore, in the final evaluation of data, the stage of recall testing during which information was elicited was not taken into consideration.

---

[1]Since the greatest portion of data analyzed was provided by experimentees at the second stage of the recall portion of the book-memory experiment, a discussion of the nature and peculiarities of the checklist employed is pertinent. The checklist (questionnaire) was given to experimentees after they had freely recalled as much information as possible about the books they had examined previously. Thus it was intended to serve as a stimulus to memory by suggesting categories of information which the experimentees might have overlooked and by providing a structured framework of choices within some categories. Several types of questions were utilized, each type having been considered the most appropriate for eliciting information in the category suggested. Although desiring to obtain as "natural" information as possible, the researchers believed it necessary to provide a structure for items on which scattered responses due to experimentees' lack of familiarity with possible descriptions was expected. This may have been a mistaken assumption, since experimentees sometimes seemed unable to select a single choice or to comprehend distinctions between choices. The three types of items appearing on the checklist may be described as (1) short answer or open-ended response, (2) multiple choice, and (3) binary or ternary choice (roughly equivalent to true-false items with an "uncertain" option). The effect of this variation in the form of questions on quantity and quality of responses elicited has not been determined; however, one observes that the multiple choice items functioned essentially as forced choice items, while the short answer and ternary choice items elicited a higher percentage of null responses or "don't know" answers. The possibility of indiscriminate guessing cannot be ruled out, especially in the case of items for which multiple options were supplied. Another factor which may have influenced the data is the well-known tendency of students, who comprised the major portion of the group of experimentees, to avoid leaving any question unanswered.

## Findings of the Book-Memory Experiment

### Results Relative to Retrieval of Known Works

From the classification of data (p. 10 above) and from a check of experimentees' responses against entries in the catalog of the University Library,[1] a measure of library users' performance in various areas strategic to retrieval of previously consulted works may be obtained. Table 2 summarizes these performance capabilities.

TABLE 2

DEMONSTRATED CAPABILITIES OF BOOK-MEMORY EXPERIMENTEES
(N = 440)

| Description of Capability | Number | Percentage |
|---|---|---|
| Experimentees capable of providing a complete author-and-title citation | 10 | 2.3 |
| Experimentees capable of providing author or title data sufficient to locate the object book in catalog | 110 | 25.0 |
| Experimentees capable of providing author or title or subject data sufficient to locate the object book in catalog | 312 | 70.9 |
| Experimentees capable of recognizing the object book on a list of approximately 600 books | 341 | 77.6 |
| Experimentees capable of recognizing the object book either on list or in bookstack, or both | 422 | 95.9 |

These measures of retrieval-oriented capabilities yield several striking observations. First, recall of the most critical catalog entries, author and title, is relatively infrequent. The number of complete

[1] See "Effectiveness of Book-memory Data for Conventional Catalog Retrieval," which follows.

citations recalled is extremely small; if the requirements for author-title retrieval are extended to admit cases in which either author or title was recalled accurately enough to permit location of the book in the catalog, still only one-fourth of respondents would be successful in retrieval attempts. However, if author or title or subject information is utilized, the retrieval rate increases to 71 per cent.[1]

Comparison of items one and four in Table 2 indicates that although free recall of accurate citations is seldom demonstrated, the ability to recognize accurate citations is extremely good. As was stated previously, the list in which the citations appeared was long and formidable, consisting of a total of approximately 600 citations. Yet, confronted with this massive listing, 78 per cent of respondents were able to select an accurate citation to an object book.

Finally, it is seen that recognition of the object book either on a list or in a bookstack is far more accurate than is recall of critical catalog entries. Ninety-six per cent of respondents recognized actual object books or their bibliographical representation. Thus, it seems reasonable to conclude that individuals who cannot recall sufficient information to permit immediate retrieval of works with which they have had previous contact would be able to recognize the relevant work among a fairly large number of works which are possibly relevant.

## Accuracy of Recall of Book Characteristics

A primary objective of the book-memory experiment was to investigate the "memorability" of certain common characteristics of books. It is of interest to know what characteristics people most frequently think

---

[1]The relationship between the third and fourth items in Table 2 has not been explored fully; a case could be made for reducing the figures for the third item by a factor of 78 per cent (the percentage of respondents capable of recognizing a printed record of author and title), reasoning that this figure represents the percentage of respondents who would indeed recognize a catalog card describing the object book. If this reduction were effected, a figure of 57 per cent would result for the third item above.

they remember, and if memory of these characteristics tends to be accurate enough to aid in describing books for retrieval in library catalogs.

Table 3 presents a comparative summary of responses to checklist items regarding various characteristics of books. The responses tabulated represent experimentees' final judgment on each item irrespective of the stage at which it was elicited. It will be noted that some items included on the checklist have not been tabulated with this summary; in most cases this is due to the paucity of responses to the item.[1]

Book characteristics presented in Table 3 are arranged in order of the proportion of substantive responses given by experimentees. The first column of figures, "Percentage Substantive Responses," indicates the proportion of respondents supplying either a correct or incorrect response, as opposed to those who either left the item blank or indicated that they didn't know or didn't remember the nature of the characteristic. Thus, a substantive response, whether it be correct or incorrect, indicates that an experimentee thought he remembered the characteristic in question.

Column two, "Percentage Substantive Responses Correct," provides an evaluation of the accuracy of experimentees' memory: When a person believed he remembered a characteristic (as evidenced by his making a substantive response), did he remember it correctly? The percentages in this column, then, are derived from the numbers represented in the first column.

The third column, "Percentage Correct of Total Response," indicates the percentage of correct responses within the total set of correct, incorrect, and null ("don't know" responses and items left blank) responses to each characteristic.

The last column, "Item on Checklist," gives the number of the item or group of items under which the characteristic appeared on the

---

[1]See Appendix B for explanation of those items not tabulated and analyzed.

TABLE 3

MEMORY OF BOOK CHARACTERISTICS
(N = 440)

| Characteristic | Percentage Substantive Responses | Percentage Substantive Responses Correct | Percentage Correct of Total Responses | Item on Check-list |
|---|---|---|---|---|
| Subject description | 99.5 | 76.0 | 75.6 | 5 |
| Level of readership | 99.1 | 53.8 | 53.4 | 4 |
| Type of work | 98.8 | 44.1 | 43.6 | 3 |
| Work in a single volume | 97.7 | 97.4 | 95.2 | 9 |
| Subject headings | 97.4 | 73.3 | 70.8 | Added |
| Condition | 95.6 | 33.6 | 32.2 | 6 |
| Number of pages (50-page intervals) | 91.6 | 23.8 | 21.8 | 6 |
| Type of binding | 88.7 | 71.5 | 63.5 | 6 |
| Chapters titled | 88.4 | 91.8 | 81.1 | 9 |
| Problems included at ends of chapters | 84.8 | 95.8 | 81.4 | 9 |
| Height (1/2" intervals) | 83.4 | 24.2 | 20.2 | 6 |
| Title | 82.7 | 27.4 | 22.7 | 2 |
| Tables included | 74.5 | 79.6 | 59.3 | 9 |
| Case studies included | 74.1 | 73.4 | 54.3 | 9 |
| Translation from another language | 73.8 | 88.6 | 65.4 | 8 |
| Figures, charts, diagrams included | 73.2 | 83.0 | 60.7 | 9 |
| Date of publication (decade) | 73.2 | 41.6 | 30.4 | 8 |
| Graphs included | 72.0 | 84.2 | 60.7 | 9 |
| Illustrations included | 69.8 | 81.8 | 57.1 | 6 |
| Index included | 68.0 | 64.2 | 43.6 | 9 |
| Footnotes included | 65.7 | 63.6 | 41.1 | 9 |
| Preface | 64.3 | 87.3 | 56.1 | 9 |
| Color of binding | 63.2 | 29.8 | 18.9 | 6 |
| Glossary included | 61.8 | 89.7 | 55.4 | 9 |
| Bibliography included | 56.8 | 56.8 | 32.3 | 9 |
| Quotations from literary works included | 55.7 | 72.7 | 40.5 | 9 |
| Light and dark color cover | 55.4 | 63.9 | 35.4 | 6 |
| Reprint or revision | 53.4 | 83.3 | 45.2 | 8 |
| Position in bookstack | 37.5 | 55.8 | 20.9 | 7 |
| Dedication | 29.3 | 61.3 | 17.9 | 9 |
| Detail of cover design | 28.4 | 52.8 | 15.0 | 6 |
| Place (city) of publication | 23.0 | 28.7 | 6.6 | 8 |
| Author | 20.9 | 76.1 | 15.9 | 1 |
| Position on shelf | 20.2 | 47.2 | 9.5 | 7 |
| Type of publisher | 18.2 | 50.0 | 9.1 | 8 |
| Published in series | 13.9 | 83.6 | 11.6 | 8 |
| Publisher's name | 7.3 | 46.8 | 3.5 | 8 |
| Call number (BF only) | 5.2 | 73.9 | 3.9 | 7 |

checklist used in Stage 2 of recall testing. Complete summaries of distributions of responses to individual characteristics are presented in Appendix B to the present report. The Appendix is arranged in order of items' appearance on the checklist.

The distinction between the percentages appearing in the second and third columns is an important one. The proportion of correct to non-correct responses regarding some characteristics shifts drastically as the base is changed from all respondents (N = 440) to just those respondents who made an assertion about the characteristic (N = 440 - null responses). See, for example, the esponses for Author and for Call number--relatively few of the total respondents correctly described these characteristics, but considering only those who attempted a description, the tendency was to be correct. On the other hand, characteristics which the majority of respondents attempted to describe show little difference between the two measures of correctness.

For convenience of discussion, book characteristics have been grouped into four categories: (1) the intellectual aspects of books--authorship, content, nature of the work, (2) the facts of publication, (3) the physical description of the book, and (4) all binary characteristics--those features which are not common to all books but which may or may not be present in a specific book.

## Memory of Intellectual Aspects of Books

Table 4 presents a summary of findings regarding memory of intellectual characteristics: author, title, subject description, subject headings, type of work, and level of readership. The percentage of respondents providing correct, incorrect, and null responses to each characteristic are shown. The last column in the table, "Response Choices on Checklist," indicates whether the item as it appeared on the checklist required experimentees to formulate their own responses or if they were given a choice of responses.

Except for subject headings, which are applied to a book in a library environment, each of these characteristics is an integral and

TABLE 4

MEMORY OF INTELLECTUAL CHARACTERISTICS OF BOOKS
(N=440)

| Characteristic | Distribution of Responses (in percentages) | | | Response Choices on Checklist |
|---|---|---|---|---|
| | Correct | Incorrect | Null | |
| Author | 15.9 | 5.0 | 79.1 | no |
| Title | 22.7 | 60.0 | 17.3 | no |
| Subject description | 75.7 | 23.8 | .5 | no |
| Subject headings (N=192) | 70.8 | 26.6 | 2.6 | no |
| Type of work | 43.6 | 55.2 | 1.2 | yes |
| Level of readership | 53.4 | 45.7 | 0.9 | yes |

unchanging aspect of a particular work. They generally are important to the book user--whether he realizes it or not--both for understanding and for identification of the book. Moreover, this group contains the characteristics which comprise the three most common approaches to traditional catalog retrieval: author, title, and subject. Data from the book-memory experiment affords an indication of the relative tendencies to remember these specifics. It should be noted once more that questions regarding author, title, and subject information were answered from unaided memory--no clues or possible choices were given respondents.

Author.--A key retrieval element is the author if a desired work, whether personal or corporate. All books in the experimental collection were considered to have personal authors or editors. The checklist item requesting the name of the author of the object book was given prominence, being the first item on the checklist. Responses to the author item were tabulated within descriptive categories, and occurred as shown in Table 5.

TABLE 5

RECALL OF AUTHOR'S NAME

| Type of Response | Number | Percentage |
|---|---|---|
| Correct first and last name | 37 | 8.5 |
| Correct last name, first initial | 2 | .5 |
| Correct last name only | 31 | 7.0 |
| Incorrect name (Misspelled or partial name only, 10 cases; wrong author named, 12 cases) | 22 | 5.0 |
| No response | 348 | 79.0 |
| Total | 440 | 100.0 |

Sixteen per cent of the responses may be considered correct (the first three items in the table) in that they provide at least minimal identification of the author. Only 5 per cent of responses are incorrect, while the item was left blank in 79 per cent of cases. This suggests that respondents may be disinclined to guess at an author's name; although the frequency of correct responses is disappointingly low, incorrect responses account for fewer than one in four of total responses. The high proportion of null responses (79 per cent) suggests that in the case of vaguely remembered works, attempted retrieval by author may be futile.

Supplementary information about authors provided by respondents was largely of a nebulous character, e.g., "two authors" (no name provided), "a woman," "a psychologist." Several responses, however, connected the author with an institution, e.g., "a psychologist at Duke University," "formerly at University of Chicago," etc. This type of information might prove useful, at least in local cataloging. As might be expected, the majority of this type of response identified University of Chicago authors. A third type of response connected the author with another of his works, e.g., "author of Client-Centered Therapy."

Title.--A second key retrieval element tested was recall of the title of the object book. It is interesting to note that in comparing title responses to author responses, almost a complete reversal of correct, incorrect, and null responses is observed. Title responses were analyzed and categorized; findings are shown in Table 6.

The checklist item dealing with title provided respondents an opportunity to suggest alternative possibilities if they believed their first-named title might be incorrect. If, in this "second try," the correct title was given, it was tabulated as a correct title in Table 6; in such cases, the first-named title was disregarded.

TABLE 6

RECALL OF TITLE

| Type of Response | Number | | Percentage |
|---|---|---|---|
| Correct | | 100 | 22.8 |
| Incorrect | | | |
| Synonym error | 84 | 19.2 | |
| Permutation | 30 | 6.8 | |
| Incomplete | 55 | 12.5 | |
| Unrecognizable | 95 | 21.5 | |
| Total incorrect | | 264 | 60.0 |
| Null | | 76 | 17.2 |
| Total | | 440 | 100.0 |

Alternative title possibilities provided in the responses indicate people's awareness of synonym confusion. Analysis of incorrectly stated titles shows that synonym errors comprise the largest single group of recognizable errors (19.2 per cent of all cases), and occurred even more frequently than null responses (17.2 per cent of all cases).

In comparing title responses to author responses, it is seen that while respondents appear reluctant to guess at an author's name, no such inhibition governs statements of titles. Although only 21 per cent of respondents provided a name purporting to be that of the author

of a given work, the likelihood is that that name is correct. By contrast, nearly 83 per cent of respondents supplied a title; however, the likelihood is that the title as stated is inaccurate.

An exploratory analysis of title responses was undertaken by a member of the research staff in an effort to identify types of errors which could be exploited for retrieval purposes. A number of interesting observations emerged from this study, a detailed report of which appears in "An Analysis of Non-Exact Title Data," attached to the present report.

Subject.--The third common retrieval element is a subject heading assigned to a book. Two types of subject data were collected in the book-memory experiment. The original plan was to extract subject specifications from experimentees' descriptions provided during the three stages of recall testing. Responses elicited in this manner were often difficult to interpret and seemed to bear little resemblance to actual headings, so an additional requirement was initiated: Experimentees were instructed to list subject headings under which they thought the object book might appear in the University Library catalog (see instruction for Part II, sheet 3a, Appendix A). The two entries in Table 3 (page 16 above) reflect this distinction: the first, "Subject description," indicates data gleaned from respondents' free verbalizations (N = 440), and the second, "Subject headings," indicates data provided in response to the added instruction (N = 192). The nature of subject information given by respondents has been the focus of a separate investigation, reported in "Accuracy and Utility of Subject-Related Responses," attached to the present report. Investigators checked subject responses (both descriptions and headings) against the actual headings applied to object books and the seventh edition of the Library of Congress Subject Heading list in order to determine whether or not a respondent's subject specification would ultimately, through following cross references if necessary, lead to the object book. Findings are summarized in Table 7, which shows the percentages of success in providing immediately and ultimately correct subject headings. Slightly over 18 per cent of respondents who provided formal subject headings would find the object book directly under the heading exactly as given, without being required

to consult variant forms or subdivisions of that heading or being directed to more appropriate headings; 71 per cent of subject headings provided would lead, through cross-references, to the exact heading. Contrary to the investigators' early pessimistic appraisal, nearly 30 per cent of subject descriptions in the form of phrases or sentences contained words or phrases which fortuitously proved to be the exact headings assigned to object books; 76 per cent would ultimately lead to the desired books.

TABLE 7

CONGRUENCE OF SUBJECT RESPONSES
TO ACTUAL SUBJECT HEADINGS

| Type of Response | Accuracy of Response | | | Base N |
|---|---|---|---|---|
| | Directly Congruent | Ultimately Congruent | Total | |
| Unstructured subject description | 29.8 | 45.8 | 75.6 | 440 |
| Estimated subject heading | 18.2 | 52.6 | 70.8 | 192 |

A check of author, title and subject information provided by respondents against the University Library catalog showed that 46 per cent of respondents had provided a subject description adequate to locate the object book either directly or through cross references. Although undoubtedly many instances of catalog failure and searcher failure contributed to the discrepancy between the two "success rates" (46 per cent vs. 76 per cent), the discrepancy does suggest that methodical, exhaustive searching of a type more likely to be effected by a machine than by a human searcher bears promise of fruitful results.

Type of work.--In order to describe books in terms of content and intent, eleven categories of works (plus an "other" category) were

identified within the experimental book collection. Examples of types are handbook, dissertation, textbook, history. Experimentees were asked to indicate the category which most closely described the object book. They were allowed to check more than one category if they thought it necessary; 29 per cent of respondents did so. Including both single and multiple responses, 43 per cent of respondents correctly categorized object books, 56 per cent did so incorrectly, and only 1 per cent failed to respond to the item.

Experimentees apparently found this item difficult. In addition to the 138 responses where two or more categories were checked as appropriate, 46 cases (9.6 per cent) occurred where the respondent checked the category "other," often giving a description of what he considered the book to be. The project staff's interpretation of these phenomena is that respondents were confused by terminology and by the large number of categories from which to choose, and that confusion might have been reduced by providing fewer and broader categories together with definitions of what each category comprised.

Level of readership.--The level of readership of a book was defined as being the audience (or purpose) for which it was intended. All books in the experimental collection were assigned to one of four levels: (1) popularization, (2) treatment for the generally educated layman, (3) work for beginning college students, (4) work for advanced students or professionals. These four categories plus an "other" option were listed on the checklist in a multiple choice arrangement; experimentees were allowed to check more than one response if they thought it necessary. Approximately 24 per cent of responses were multiple responses--more than one option had been checked. A multiple response was considered correct if one of the options checked was the correct one; if neither was correct, the response was considered wrong. The tendency on the part of respondents was to assign books to a higher level than the researchers had done. This may be attributable to the fact that the researchers were attempting to use the general population as a referent when assigning levels; perhaps the experimentees were thinking in terms of a university population. At any rate, only slightly

more than half (53.4 per cent) of the respondents were able to recall the approximate level of object books although 99 per cent attempted an answer. The element of subjective judgment enters in here; for this reason, any notation of the level of a work on its catalog representation would necessarily be open to question.

Memory of Facts of Publication

A second group of characteristics includes facts about the publication of a book. Table 8 summarizes findings relative to these characteristics. It is interesting to note that three of the four characteristics are normally noted in cataloging practice and are considered indispensable bibliographic information, but none seems to be greatly memorable.

TABLE 8

MEMORY OF FACTS OF PUBLICATION
(N=440)

| Characteristic | Distribution of Responses (in percentages) | | | Response Choices on Checklist |
|---|---|---|---|---|
| | Correct | Incorrect | Null | |
| Publisher | 3.5 | 3.8 | 92.7 | no |
| Type of publisher | 9.1 | 9.1 | 81.8 | no |
| City of publication | 6.6 | 16.4 | 77.0 | no |
| Date (decade) | 30.4 | 42.8 | 26.8 | no |

Publisher.--Slightly more than 7 per cent of the 440 respondents attempted to supply the name of the publisher of the object book, and these responses were nearly evenly divided between correct and incorrect specifications. Only 3.5 per cent of all respondents were able to correctly

name the publisher. With the exception of Penguin Books, which was correctly identified three times, only two publishers were correctly identified on more than one occasion: University of Chicago Press and Free Press, both of which are well-known to University of Chicago students. Seventy-four publishers were represented in the experimental collection; those correctly identified and the number of correct identifications for each are as follows: University of Chicago Press (2), Duke University Press (1), Free Press (2), Grove Press (1), Iowa University Press (1), Naturegraph (1), Pantheon (1), Penguin Books (3), Philosophical Library (1), Prentice-Hall (1), Yale University Press (1).

While it is generally agreed that the identity of a publisher is an important item in describing a particular book, it appears that few people take notice of or remember publishers if they have no reason to do so.

Type of publisher.--Responses describing the type of publisher of object books were equally divided between correct and incorrect--9 per cent of the 440 respondents provided correct descriptions. On the checklist the question regarding type of publisher was of the open-ended variety; no choice of responses was suggested. Thus, reponses were for the most part verbalizations which had to be interpreted. Six types of publishers had been identified within the experimental book collection (trade, university, educational, government, society, author). Responses such as "general" were interpreted as meaning "trade" and were judged correct; an example of a response judged incorrect was "not scholarly" in description of a university press. Responses to this item illustrate the terminological difficulties encountered when choices (or explanations of terms) were not offered. It may be concluded that lay persons are not aware of the distinctions among types of publishers and their characteristic output.

Place of publication.--Twenty-three per cent of respondents gave information purporting to be the place of publication of an object book; about one-third of these responses were accurate. Only the name of the city of publication was considered correct. Most of the incorrect responses were names of countries, e.g., United States, England. Predictably,

the city most frequently identified correctly was New York. Also, when a respondent had correctly identified a publisher as a specific university press, the city of publication was usually known; however, since this instance arose only four times, the generalization may be suspect.

Date of publication.--Thirty per cent of respondents were able to specify within the decade (1930's, 1950's, etc.) the date of publication of an object book. Nearly as many (27 per cent) failed to respond to the item. Responses to the item were equivalent to free verbalizations, some respondents naming a single year, and others giving varying spans of years. Where spans of years (e.g., 1963-65, 1920's) were given, the midpoint in the span was considered to be the response.

When considering a characteristic that is continuously distributed as is date, the problem in evaluating responses and also in planning retrieval strategy is one of determining the latitude of error that can be tolerated. A small latitude, as two or three years, may be quite specific in identifying a manageable segment of a collection of books; however, few persons seem able to specify dates very closely. A wider latitude, as ten or twenty years, will admit more correct responses, but is correspondingly less specific. For example, 264 (60 per cent) of the 440 object books were published since 1950, a span of less than two decades. Thus a date specification with a broad span, as 1960's would identify a very large portion of the collection.

## Memory of Physical Characteristics

The third group of book characteristics includes those characteristics which are associated with a book's physical description or location. Some of these characteristics may be considered permanent, as number of pages or height; others may change, or a variation between copies of the same work may exist. Thus, should any of these non-constant characteristics be considered for catalog notation, steps would have to be taken to ensure the updating of the catalog or the permanence of the characteristic.

Table 9 presents a summary of responses pertaining to books' physical characteristics. As in previous tables, the right column, "Response Choices on Checklist," indicates whether or not the item was in multiple-choice form on the checklist. A "no" in the column means that respondents structured answers themselves--no suggestions were given.

Height.--Books in the experimental collection ranged in height from seven to eleven inches, with the majority clustered about the median of eight and one-half inches.[1] Respondent's specifications of heights of object books ranged from five to fourteen inches. During recall testing, a set of "sample books" labeled with their actual heights was on display for experimentees to consult. The sample books were provided after the pilot study showed an amazing incongruity between actual book heights and respondents' specifications. The researchers concluded that experimentees needed help of some type in judging heights since they apparently had little conception of size. Even with samples clearly visible, respondents' memory of book height is not impressive. Although 83 per cent of respondents attempted to state the height of object books, only 20 per cent were able to specify actual heights within one-half inch.

Height is presently noted in catalog descriptions of books, but findings of this experiment suggest that it is not particularly memorable. Moreover, specifications of height approach meaninglessness when referring to books of "average" size, since this is such a large group, but when height specifications refer to books of extremely large or small size they may be more meaningful. For these reasons, height does not appear to be a particularly promising retrieval characteristic.

Number of pages.--Responses regarding number of pages followed a pattern similar to that of responses to height, in that the great majority of respondents attempted an answer, but that answer was usually incorrect. Twenty-two per cent of respondents were able to specify within fifty-page intervals (e.g., 50-99pp., 100-149pp.) the correct

---

[1]Eighty-one per cent of object books were between eight and nine and three-eighths inches tall.

TABLE 9

MEMORY OF PHYSICAL CHARACTERISTICS

| Characteristic | Distribution of Responses (in percentages) | | | Response Choices on Checklist |
|---|---|---|---|---|
| | Correct | Incorrect | Null | |
| Height (to nearest one-half inch) | 20.2 | 63.2 | 16.6 | yes[a] |
| Number of pages (by 50-page intervals) | 21.8 | 69.8 | 8.4 | no |
| Type of binding | 63.5 | 25.2 | 11.3 | yes |
| Color | 18.9 | 44.3 | 36.8 | yes |
| Light or dark color | 35.4 | 20.0 | 44.6 | yes |
| Details of cover design | 15.0 | 13.4 | 71.6 | yes |
| Condition | 32.2 | 63.6 | 4.1 | yes |
| Call number (BF) | 3.9 | 1.3 | 94.8 | no |
| Position in bookstack | 20.9 | 16.6 | 62.5 | no |
| Position on shelf | 9.5 | 10.7 | 79.8 | no |

[a]Examples of books of varying heights were labeled with their actual heights and placed where experimentees could see them.

number of pages; 70 per cent were incorrect in their specification. No suggested responses or options appeared on the checklist, thus responses took a variety of forms. When a span of pages was given, the midpoint in the span was considered to be the response, which was tabulated within the appropriate fifty-page interval. Although books in the experimental collection ranged from approximately twenty-five to over 550 pages, half of the object books were between 200 and 399 pages in length; 55 per cent of correct answers were in reference to these books.

Type of binding.--Books in the experimental collection had seven different types of bindings: library bindings, publisher's cloth bindings, library paperback bindings, paper-board covers, pamphlet bindings, and leather bindings. These categories appeared on the checklist in the form of a multiple choice question. Respondents were fairly successful in specifying the type of binding of object books: 64 per cent were correct, while 25 per cent were incorrect. It must be noted that 75 per cent of the object books had cloth publisher's bindings, and books in this category accounted for 246 (88 per cent) of the 279 correct responses.

In light of the fact that large numbers of object books exhibited average or typical conditions of the four preceding characteristics (date of publication, height, number of pages, type of binding), one should consider the distribution of responses which might be expected under conditions of random guessing constrained by some knowledge of which choices are in general the most likely. The observed distribution of responses to object books appears to be similar to an expected random distribution, thus suggesting that knowledge of probable distributions of book characteristics may be operable to a greater extent than memory of characteristics of a particular book. The important implications of this point can be more clearly seen from the treatment by W. S. Cooper in "The Potential Usefulness of Catalog Access Points Other Than Author, Title, and Subject."

Color.--The checklist item inquiring into color was a multiple choice item (ten colors listed); respondents were requested to check the appropriate color to describe object books. Only 19 per cent of respondents were able to recall color correctly. Nearly twice that many, 37 per cent, failed to respond to the item, and 44 per cent provided an incorrect description.

Recall (in fact, identification) of color is complicated by two factors: (1) the difficulty in determining and classifying the color of certain books, and (2) the occurrence of multi-color books. Colors of books, unfortunately, are not confined to clean, bright primary and secondary colors: the effects of wear tend to obscure the original color of the binding, and some colors in their various hues and shades are

inherently difficult to distinguish. Second, many books are bound with more than one color, for example, some flamboyant multicolored patterns are found, and half-bindings which have one color on the spine and another on the covers are fairly common.

Prior to the conduct of the experiment, the research group had by consensus agreed upon the color of each book in the experimental collection. When responses were tallied, each response was judged correct or incorrect according to the researchers' prior decisions. Multicolored books were considered to be a separate color class, so that a total of eleven color specifications was possible. Table 10 gives an indication of the memorability of the various colors. There are no data concerning white books, since none of the object books was white. Results pertaining to multicolored books are probably misleading, since experimentees received no special instructions regarding multiple colors, and many checked just one color. ("Correct" multicolor responses were those in which the respondent indicated that the book actually was more than one color.)

The research staff had expected that color would prove to be a memorable characteristic, since nearly every book user probably believes that he remembers the colors of his books quite accurately. Therefore it was surprising to find that color proved to be one of the least memorable of all characteristics. Upon reflection, the researchers concluded that memory of color of specific books is probably a function of frequent use of those books, and that a single casual use of a book does not provide motivation to remember the color.

Light or dark color.--The checklist item regarding lightness or darkness of color proved to be an ambiguous one. It was the intent of the researchers that respondents consider the item only if they were unable to recall the exact color of an object book; however, many respondents who did recall color also answered this item. Therefore, responses to this item provide inconclusive results. It will be noted that even though the item was variously construed, nearly twice as many respondents (35.4 per cent) accurately described object books as light or dark than accurately identified specific colors (18.9 per cent), as might be

expected in view of the diminished number of choice categories available for responding to each item.

TABLE 10

MEMORABILITY OF INDIVIDUAL COLORS

| Color | Distribution of Responses (in percentages) | | | Base N |
|---|---|---|---|---|
| | Correct | Incorrect | Null | |
| Blue | 14.4 | 50.0 | 35.6 | 90 |
| Brown | 31.6 | 42.1 | 23.6 | 19 |
| Orange | 0.0 | 80.0 | 20.0 | 5 |
| Gray | 23.8 | 28.6 | 47.6 | 21 |
| Black | 24.0 | 26.7 | 49.3 | 71 |
| Red | 22.2 | 43.2 | 34.6 | 104 |
| Green | 11.4 | 42.8 | 45.8 | 35 |
| Purple | 28.6 | 57.1 | 14.3 | 7 |
| Yellow | 41.2 | 35.3 | 23.5 | 17 |
| Multi-colored | 8.5 | 60.5 | 31.0 | 71 |
| Total | | | | 440 |

Details of cover design.--The checklist item dealing with details of cover design was an optional item--it was intended to have been ignored if it didn't apply to an object book. Sixty-six respondents chose not to ignore the item, but wrote in "nothing." These respondents plus fifty-nine who checked one of the options provided a total of 125 responses. Of these 125 substantive responses, 53 per cent were correct;

47 per cent incorrect. Failure to respond to this item cannot be interpreted in the same way it is in reference to other items, in that a null response may signify either of two conditions: the object book didn't have any type of design, etc., on the cover, or, the respondent simply didn't recall.

Condition.--The condition of object books was correctly recalled by 32 per cent of respondents; 64 per cent were incorrect. Five possibilities for describing condition were suggested: new, fairly new, used, worn, and bad. Books in the experimental collection had been judged and described by the research staff. Respondents described object books in the aggregate as being in better condition than the researchers had thought. Indeed, only one object book was described as being "bad" by a respondent, while the researchers had identified sixty-six as "bad."

Describing condition involves a subjective judgment, and the actual conditon of a book is, of course, subject to change. These facts plus relatively unimpressive memorability, suggest that considering condition as a cataloging and retrieval possibility would be unprofitable.

Call number.--Respondents were asked whether they recalled call numbers (Library of Congress classification numbers) of object books. There was no instance of a respondent recalling a completely accurate call number, but seventeen respondents (4 per cent) managed to recall the initial letters of the call number--BF. Of these seventeen, seven 41 per cent) were given by respondents who were majors or graduate students in psychology, people who might be expected to know classification numbers in their field. Thus, it is difficult to say whether call number recall is a function of memory or of familiarity with typical classification in the field. It will be noted that nearly 95 per cent of respondents made no attempt to state even a partial call number, and those who did tended to be correct.

Position in bookstack and position on shelf.--The bookstack in which the experimental collection was housed was approximately three feet wide and contained six shelves of books. Respondents were asked on which shelf the object book had been located and whether it had been

on the left, middle, or right part of that shelf. Twenty-one per cent of respondents remembered that the object book had been in the top, middle, or bottom segments of the bookstack; only 10 per cent remembered that it had been in the left, middle, or right shelf position. There was a high incidence of null responses to both items, indicating that physical location is apparently not a memorable characteristic.

Memory of Binary Characteristics

The final group of book characteristics to be considered consists of characteristics which are either present or absent in any given book, and which have been designated "binary."

The binary characteristics displayed in Table 11 are arranged in order of percentages of correct responses. The column headed "Percentage of Object Books Possessing Characteristic" shows the relative frequency of each characteristic's occurrence; for example, 97.3 per cent of the 440 object books were published as a single volume. Columns headed "Correct" and "Incorrect" do not distinguish qualitatively among responses beyond defining their accuracy. Thus, responses of "yes" given that the object book did possess a characteristic, and "no" given that it did not, are subsumed under the group of correct responses. Null responses are cases in which respondents checked the option "don't know" or left the item blank.

Fourteen of the eighteen characteristics considered as binary appeared on the checklist as a group of yes-no items (checklist question number 9). Two columns of blanks, headed "Yes" and "No" were printed on the checklist. In order to discourage indiscriminate guessing, experimentees were instructed to supply a third column of blanks headed "Don't Know."

The four remaining items, Translation, Illustrations, Reprint-Revision, and Series, did not appear with the above group of fourteen but were ultimately tallied in the same manner as the fourteen original binary characteristics.

TABLE 11

MEMORY OF BINARY BOOK CHARACTERISTICS
(N=440)

| Characteristic | Distribution of Responses (in percentages) | | | Percentage of Object Books Possessing Characteristic |
|---|---|---|---|---|
| | Correct | Incorrect | Null | |
| Single volume | 95.2 | 2.5 | 2.3 | 97.3 |
| Problems | 81.4 | 3.4 | 15.2 | 1.4 |
| Chapter titles | 81.1 | 7.3 | 11.6 | 95.7 |
| Translation | 65.4 | 8.4 | 26.2 | 13.6 |
| Graphs | 60.7 | 11.3 | 28.0 | 20.0 |
| Figures, charts diagrams | 60.7 | 12.5 | 26.8 | 30.9 |
| Tables | 59.3 | 15.2 | 25.5 | 28.8 |
| Illustrations | 57.1 | 12.7 | 30.2 | 31.2 |
| Preface | 56.1 | 8.2 | 35.7 | 91.6 |
| Glossary | 55.4 | 6.4 | 38.2 | 4.8 |
| Case studies | 54.3 | 19.8 | 25.9 | 37.7 |
| Reprint-revision | 45.2 | 9.1 | 45.7 | 19.1 |
| Index | 43.6 | 24.4 | 32.0 | 68.4 |
| Footnotes | 41.1 | 24.6 | 34.3 | 69.7 |
| Quotations | 40.5 | 15.2 | 44.3 | 32.2 |
| Bibliography | 32.3 | 24.5 | 43.2 | 49.6 |
| Dedication | 17.9 | 11.4 | 70.7 | 44.6 |
| Series | 11.6 | 2.3 | 86.1 | 20.0 |

Translation.--The checklist item regarding translation was composed of two parts, the first of which asked merely whether the book was or was not translated into English from another language. Responses to this part were treated as were those to other questions regarding binary characteristics, and it is seen that 65 per cent of respondents were accurate in their responses. The majority of correct responses were "no," since only 13.6 per cent of object books actually had been translated. The second part of the item requested respondents to identify the original language of translated books. Responses here were sparse; only twenty-one were elicited, of which twenty were correct. German was the language most frequently correctly identified.

Series.--Experimentees were requested to supply the names of series in which object books had been published; three were able to do so correctly. A number of respondents offered instead a response of "none" or "not a series." These responses were tallied as if the question had referred to a binary characteristic; thus findings are possibly not indicative of respondents' memory patterns, since the intent of the item was sacrificed in order to deal with the data that was gathered.

Illustrations.--Experimentees were asked to describe the kind of illustrations (if any) which appeared in object books. A number of respondents supplied descriptions of types of illustrations, e.g., photographs, drawings; others merely answered yes or no. It was decided to treat all these responses as binary, that is, in terms of yes or no. Thus, 52 per cent of respondents correctly specified whether object books were or were not illustrated.

Reprint-revision.--The question asking whether or not an object book was a reprinted or a revised edition was actually binary in intent if not in form. Answers elicited were usually of the yes-no variety; occasionally respondents specified that the work was reprinted or that it was a revised edition. All responses were treated as yes, no, or don't know responses in tallying.

Simple binary characteristics.--The remainder of the binary characteristics--those which required no qualitative description by

experimentees--require no special explanation beyond that which was given above. It will be noted that the two characteristics eliciting the highest proportion of correct responses, Single Volume and Problems, appear to be memorable but are only specific in isolating a distinctive portion of a book collection in reference to the atypical state. That is, 97.3 per cent of object books were single volumes (they were not one volume of a set), so a response of "yes" has little specificity; by contrast, a correct response of "no" has high specificity. The reverse is true of problems--a book that does have problems is in the minority case, and a positive statement that a book does in fact have problems denotes high specificity.

Several of these binary characteristics are now noted in typical catalog representation, others are non-standard catalog data. Undoubtedly each of them would have significance to some catalog user at some time, but their significance as possible retrieval points is dependent upon their memorability and their distribution throughout a collection. From memory data alone, characteristics with low memorability can probably be eliminated from consideration as retrieval points.

## Summary and Discussion

Findings of the book-memory experiment reported here provide information of potential value in planning future catalogs. First, an indication of the memorability of various book characteristics is of value for determining which characteristics book users note and which ones they ignore, at least in a casual, weakly-motivated exposure situation. Characteristics that appear to be memorable are worthy of further investigation into their potential utility in retrieval systems. Next, one must take into account the "statistical usefulness" of these clues. That is, even a memorable characteristic, such as a broad subject classification, may be of small value if many books are similarly classified. It is possible to estimate the probable increase in retrieval efficiency that would be gained by provision of additional catalog access points to books, a problem investigated and reported by W. S. Cooper in "The Potential Usefulness of Catalog Access Points Other Than Author, Title, and Subject."

Data gathered in this experiment allows us to compare the memorability of three sets of characteristics: those which presently comprise standard entries or approaches in alphabetic catalogs--primarily author, title, subject headings; those which presently comprise elements of catalog records; and those which presently are not described on catalog records.

In present alphabetic catalogs, retrieval of desired works may be effected only through consulting one or more of the standard entries assigned to each work. Usually, each work has at least three such entries, author, title, and one or more subject headings. Findings of the book-memory experiment indicate that subject headings are the best specified of these access points.

Recalling the distinction between subject headings and subject descriptions, we note that both varieties of subject information were found to be potentially effective for retrieval of object books in more than 70 per cent of cases. Eighteen per cent of headings and 30 per cent of descriptions provided by respondents proved to match exactly the actual subject headings applied to object books. It must be kept in mind that all experimentees were asked to provide subject descriptions, while less than half of them were asked to suggest approximations of formal subject headings, resulting in unequal data bases; still, it is surprising that unstructured subject descriptions allow as good access to object books as estimated subject headings do. Of even greater interest is the observation that unstructured descriptions more frequently proved to be exactly accurate headings than were the attempts to guess actual subject headings. Why this should be the case is a matter for speculation--are library users inhibited by the system of formalized subject headings? Would a system of subject description other than that of the Library of Congress provide improved access and easier use? Would regular updating of assigned subject headings to keep them consistent with current terminology and usage improve access?

Turning to other standard catalog entries, we see that the author and the title of previously-examined books are remembered less frequently

and with less accuracy than is subject information. Approximately 16 per cent of authors were recalled, 23 per cent of titles. There is, of course, no method of approach to titles or authors corresponding to the syndetic approach to subject headings in present catalogs; thus, a library user with an inaccurate author or title specification is at a dead end. To further decrease the chances of retrieval by title, certain types of titles are commonly not represented by title entries in catalogs, for example, "nondistinctive" titles. Analysis of elicited title data revealed no consistent patterns of errors capable of exploitation, and no efficient method of utilizing separate elements of title specifications for retrieval. It was observed, however, that there appears to be an inverse relationship between correct title specification and the length of the title--respondents demonstrated better recall of short titles than of long ones. Also, the data indicates that a permuted title index would permit access to many titles presently unretrievable.

Of the standard means of access, then, subject headings (or some method of subject description) appear to be the most memorable. Further research into library users' conceptual processes as applicable to subject specifications and methods of representing subject specifications on catalog records should lead to improved retrievability through subject approaches.

The memorability of descriptive elements presently included in catalog records appears to be low. It is observed that publication information is infrequently remembered accurately, as are facts about a book's physical description.

Nonstandard catalog information, that is elements not recorded under present cataloging rules, evidences a wide range of memorability. A number of generalizations may be made regarding memorability of these characteristics. First, characteristics relevant to a book's existence as a physical object are poorly remembered--in fact, surprisingly so. Color is an outstanding example of this phenomenon, as are a book's condition and details of the appearance of its cover. An item appeared on the checklist inquiring into object books' format; responses to the

item were infrequent enough to preclude further consideration. Second, characteristics evidencing better memorability were most frequently those bearing on aspects of books' intellectual content. Problems, chapter titles, illustrative matter such as tables, figures, etc., preface, and glossary elicited fairly accurate responses, and all may be characterized as intellectual aids to the reader. These characteristics also have high visual impact, a fact which may contribute to their memorability. Furthermore, in regard to illustrative matter, it is interesting to note that cataloging rules have consistently encouraged noting of various types of graphic presentations (e.g., charts, photographs, plates) when their inclusion in a work seems significant; however, the trend is toward the simpler method of describing most non-text material as "illus."

Findings of the book-memory experiment indicate tendencies to remember certain characteristics of previously-used books; however, to conclude that these characteristics are indeed "memorable" and therefore probably significant for retrieval is to ignore other factors which must be considered as well. At least four considerations involved in assessing particular characteristics' potential utility for retrieval of specific works can be suggested.

1. Memorability.--The retrieval utility of a given characteristic is highly dependent upon accuracy of recall (human memory). Inaccurate recall obviously impedes the retrieval process, while absence of recall contributes nothing. Purely for the sake of illustration, let us consider the following criterion of memorability: A majority of all respondents (51 per cent or more) correctly described the characteristic in question, and, discounting respondents who made no attempt to describe it, the proportion of correct to incorrect responses is at least two to one. Application of this criterion reveals that fourteen characteristics are likely to be specified accurately (see Table 3, page 16 above). These fourteen are Single volume, Problems, Chapter titles, Glossary, Translation, Preface, Graphs, Figures-charts-diagrams, Illustrations, Tables, Case studies, Subject description, Subject headings, Type of binding. Other characteristics exhibit varying degrees of memorability which may or may

not be capable of exploitation for retrieval; the fact that they do not meet the memorability criterion is, of course, not to imply that they may not be valuable elements of a catalog record.

Any measure of memorability which is derived solely by comparing percentages of accurate and inaccurate responses is, of course, suspect. Such an oversimplified measure can indicate only observed response patterns. It does not take into account any deviation of responses from an expected random distribution, and thus cannot claim to measure actual recall. The relationship of randomness to memorability has been explored by W. S. Cooper and is reported in his paper, "The Potential Usefulness of Catalog Access Points Other Than Author, Title, and Subject."

2. Permanence.--A second consideration is of a given characteristic's permanence and consistency over time, over various copies of the same work, and of location. Some characteristics are immediately recognized as temporary or varying, for example, condition, type of binding--even color may vary between original publishers' bindings and rebindings. (These two latter characteristics could, of course, be controlled in libraries.) Another group of characteristics may be more subtly variant, as in different libraries (or even the same library at different times), for example, call number, location in stacks. It can be seen, however, that none of these possibly impermanent characteristics, with the exception of type of binding, meet the first criterion of memorability, a fact which is interesting in itself.

3. Unambiguity.--Frequently, evaluations of the nature of a given characteristic are ambiguous, are relative to a given clientele, or are the result of various subjective interpretations. In some cases, clear definitions are lacking. To cite an example, level of readership is clearly relative to a specific clientele: a work considered difficult or advanced by the lay public may be elementary to a specialist in the field. Another example of an ambiguous characteristic is color. Blue is recognizable, so is green, but between blue and green on the spectrum lie a number of shades which are difficult to define. Also, library terminology may prove a problem to library users, as may subtle distinctions which users have no cause to notice. Catalog designers should maintain

awareness of the possibility of misinterpretation of descriptive elements and either eliminate ambiguous elements or make clear definitions available to the library's clientele.

4. Specificity.--Retrieval utility of a given characteristic is also dependent upon its capacity to define a manageable portion of a total collection. That is, the presence, absence, or quality of Characteristic X should define a specific percentage of the collection. Letting $X^1$ represent the books possessing a given quality of the characteristic and C the total collection, we note that specificity increases as the proportion $X^1/C$ decreases, and is of negligible value when $X^1/C$ is a large proportion. Thus, the fact that a given book has an original cloth publisher's binding identifies approximately 51 per cent of the collection as candidate books; the fact that a book has a pamphlet binding identifies about 16 per cent of the collection. Characteristics which have only two possible qualities (presence or absence) vary greatly in their specificity. This phenomenon should be considered in designing retrieval systems, and search strategies developed which will take primary advantage of specifications which define fairly small proportions of a collection.

The papers which follow report investigations into several characteristics' actual and potential retrieval utility. These investigations were conducted by members of the research group and were based on data collected in the book-memory experiment. These reports, together with the findings of the book-memory experiment, present various perspectives for viewing cataloging and retrieval practices. The information presented and the conclusions reached contain valuable insights into the problem of retrieval of specific works.

## EVALUATION OF VARIATIONS IN RESPONSE PATTERNS OF PSYCHOLOGY AND NON-PSYCHOLOGY STUDENTS FOR ALL CHARACTERISTICS

Helen F. Schmierer

As noted earlier (cf. "Memorability of Book Characteristics: An Experimental Study," p. 4) books used in the experiment were drawn from the psychology (BF) collection of the University of Chicago Library. One might expect that psychology students would provide more accurate responses to questions concerning these books than non-psychology students on such characteristics as author, title, subject of call number, if only because the psychology student is presumably more familiar with the literature in the field. It was therefore thought profitable to evaluate responses in terms of experimentee background[1] in order to establish whether psychology student responses were significantly different from those of the non-psychology student.

Responses which comprised the data base (440) were separated into two groups according to the psychology or non-psychology status of experimentees.[2] The initial step in comparing performances was accomplished by applying the chi-square test; results were evaluated at 95 per cent confidence level. Responses concerning nine characteristics (publisher, condition, call number, problems at end of chapter, type of publisher, translation, type of binding, place of publication, and type of work) showed statistical significance.

The data for these nine characteristics were then examined to determine the nature of the variation between the performance of the psychology majors and the remainder of the respondents. For each of the

---

[1]Experimentees were asked to report their current academic status during the exposure session. Psychology student is defined as a psychology major (if undergraduate) or as atudent within the psychology department (if graduate student).

[2]See tables in Appendix C.

two classes of experimentees the following percentages were calculated for each of the nine characteristics:

$$\text{(A)} \quad \frac{\text{number of correct responses}}{x}$$

$$\text{(B)} \quad \frac{\text{Number of correct responses - number of incorrect responses}}{x}$$

(x being total number of responses within a class: psychology, seventy-six; non-psychology, 364). (A) gives simply the percentage of correct responses, while (B) was designed to take into account the effect of erroneous replies.[1]

In both computations higher percentages indicate superior performance. Negative (!) percentages from (B) indicate that the number of incorrect responses exceeded the correct ones. Performances on both measures are shown in Table 1.

In three instances--problems, call number and condition of book--psychology students performed better consistently. In three other cases--translation, publisher and type of work--non-psychology students consistently evidenced better performance. In the three remaining cases performance was not as simple to evaluate.

For only one of the characteristics (call number) for which it was hypothesized that psychology students would perform better was a statistically significant difference in performance between psychology and non-psychology students found. Psychology students did perform better in this case.

---

[1]For the purpose of this evaluation null responses were not included. Although it can be hypothesized that a null response is better than an incorrect response, it is impossible to assign any real value to a null.

TABLE 1

COMPARISON OF RESPONSE ACCURACY SHOWN BY PSYCHOLOGY AND NON-PSYCHOLOGY STUDENTS ON NINE STATISTICALLY SIGNIFICANT CHARACTERISTICS

| Characteristic | Percentage Correct | | | |
|---|---|---|---|---|
| | Measure A | | Measure B | |
| | Non-Psych | Psych | Non-Psych | Psych |
| Type of work | 47.4 | 25.0 | - 3.6 | -50.0 |
| Condition | 29.6 | 44.7 | -36.2 | - 7.9 |
| Type of binding | 64.3 | 59.2 | 37.6 | 40.8 |
| Problems | 78.9 | 93.4 | 75.2 | 90.7 |
| Translation | 68.0 | 53.9 | 59.0 | 48.9 |
| Place | 7.4 | 2.6 | -11.2 | - 2.6 |
| Type of publisher | 10.4 | 2.6 | 0.0 | 0.0 |
| Publisher | 4.1 | 0.0 | -0.3 | - 1.3 |
| Call number | 2.7 | 9.8 | 1.3 | 7.9 |

However, in evaluating the raw data for all characteristics showing statistically significant differences in response performance no logical pattern of variation between psychology and non-psychology students can be seen. Therefore, it is reasonable to conclude that experimentee background had no appreciable effect on performance.

# EFFECTIVENESS OF BOOK-MEMORY DATA FOR CONVENTIONAL CATALOG RETRIEVAL

Delores K. Vaughan

Information provided by respondents in the Book-Memory experiment was used to search the University of Chicago Library catalog in an attempt to assess the retrieval effectiveness of information recalled. For each book recalled by each experimentee, a search memo was prepared, recording data concerning the author, title, and subject description or subject headings provided by the experimentee.

Author and title information was transcribed exactly as given by respondents, i.e., their statement of the author's name, the title of the work, and any alternative possibilities suggested for either category. If subject heading possibilities were given, these were transcribed with subject data. The bulk of the subject data transcribed was in the form of key words or phrases extracted from the description of the subject of each book provided by the respondent.

In cases where respondents provided different or contradictory information during the succession of experimental stages, the information provided at the latest stage was used, assuming that this represented the respondent's final judgment. Where no information was given, this part of the memo was left blank.

In this manner, one search memo was prepared for each book (object book) recalled by each experimentee. Each search memo specified (1) the actual author and title of the object book, and (2) the information designating author, title, and subject as provided by the experimentee.

The search was conducted at the public catalog of Harper Library (the main catalog of the University Library collections). All of the books used in the Book-Memory experiment were known to be represented

(at least, minimally) in this catalog. Each memo was searched individually by as many of the three approaches (author, title, subject) as possible. Individual searches terminated when all possible approaches had been attempted.

Progress and results of the searches were recorded on the memos: the existence or non-existence in the catalog of a suggested entry or heading, the total number of cards entered under each heading consulted, and, when a book was found, the position of the appropriate card among those bearing the heading, e.g., the 45th of 70 cards.

Each memo was searched through all approaches provided--if the experimentee had provided author and title and subject information, all three were utilized; theoretically the object book could have been "found" by all three approaches. In cases of respondents' providing several alternative possibilities under one approach, the searcher utilized only as many alternatives as were necessary to find the object book. For example, if three subject headings had been provided and the object book was located through the first one searched, the remaining two headings were not searched. If only one type of information was provided, then, of course, that approach was the only one attempted. Searches were considered successful when a catalog card representing the object book was located, failures when all possible entries and headings had been searched unsuccessfully.

Four categories of approaches have been identified for summarizing catalog search results: (1) complete citation, that is, author's complete and correct name plus the title of the work, (2) author only, in varying degrees of completeness or correctness, (3) title only, and (4) subject description and/or suggested subject headings only. Results are shown in Table 1 in terms of the disposition of each search memo: the object book was either found or not found. In the cases of books' being found under multiple approaches, a schedule of priority of successes was assigned--a complete citation takes priority over author, author over title, title over subject--so that each book was considered "found" under only one approach.

Of the 440 memos searched, 312 (71 per cent) of the object books were successfully located through at least one approach; 128 (29 per cent) were not located. Of the 312 successful searches, fifty-two were found through more than one approach, usually by subject in addition to author and/or title. However, in Table 1 only the first (priority) find for each memo is tabulated. Table 1 shows the distribution of approaches under which object books were found.

TABLE 1

RESULTS OF CATALOG SEARCHES ON INFORMATION GIVEN BY RESPONDENTS

| Result of Search | Number | Percentage |
|---|---|---|
| Object book found by complete citation | 10 | 2.3 |
| Object book found through author entry | 58 | 13.2 |
| Object book found through title entry | 52 | 11.8 |
| Object book found through subject heading | 192 | 43.6 |
| Object book not found | 128 | 29.0 |
| Total | 440 | 100.0 |

The length of individual searched varied from one to more than 2,000 catalog cards. Larger numbers of cards were consulted in subject approaches than in author of title approaches. The number of cards bearing a given subject heading (including subdivisions) ranged from one to 1,550. Most subjects specified by respondents were of a general or broad nature and consequently represented large numbers of cards, usually between 300 and 600. It is important to note that the data

which follow represent the numbers of cards consulted under various entries or headings prior to and including the location of the relevant card; they do not show the total number of cards possibly relevant. For example, there might be seventy-five cards filed under a given author entry; if the relevant card was the twentieth one, that search length is twenty cards (plus the number of cards searched under other entries, if any, prior to location of the relevant entry). Data on actual search lengths is presented in Tables 2 and 3 which follow.

Table 2 indicates the length of individual successful searches in spans of numbers of cards. Only one successful find per search memo is shown; figures are for priority finds. Table 3 indicates search lengths for all finds--if one search memo yielded two or more successes under different approaches, all are tabulated. The approach category "complete citation" has been distributed into its separate component approaches; the ten successes in this category were added to both the author and the title rows.

Comparing Table 2 with Table 3, we see that the greatest number of additional successes came from subject approaches: 234 search memos contained subject information that led to the object card; 192 of these subject successes had been priority successes, thus forty-two respondents had provided accurate (or adequate) subject information in addition to accurate author or title information.

Again comparing Tables 2 and 3, we note no great difference in the distribution of search lengths as they are grouped. Although it is seen that subject searches involve the manipulation of the greatest numbers of cards, the addition of the non-priority subject successes did not increase the average search lengths.

The distribution of search lengths according to approach category shows quite clearly that a complete citation (author's full name plus the title of the object book) provides the most expedient approach to the catalog; however, few respondents were able to provide a complete citation. The next most expedient approach is title--no title searches involved consulting more than ten cards. Title entries are, of course fairly

TABLE 2

LENGTH OF SEARCHES (PRIORITY SUCCESSES)

| Approach | Number of Cards Manipulated in Locating Object Book | | | | | Total |
|---|---|---|---|---|---|---|
| | Direct | 2-10 | 11-50 | 51-100 | 100+ | |
| Complete citation | 10 | .. | .. | .. | .. | 10 |
| Author | .. | 24 | 20 | 14 | .. | 58 |
| Title | 46 | 6 | .. | .. | .. | 52 |
| Subject | .. | 28 | 38 | 39 | 87 | 192 |
| Total | 56 | 58 | 58 | 53 | 87 | 312 |
| Percent | 17.9 | 18.6 | 18.6 | 17.0 | 29.9 | 100.0 |

TABLE 3

LENGTH OF SEARCHES (MULTIPLE SUCCESSES)

| Approach | Number of Cards Manipulated in Locating Object Book | | | | | Total |
|---|---|---|---|---|---|---|
| | Direct | 2-10 | 11-50 | 51-100 | 100+ | |
| Author | .. | 34 | 20 | 14 | .. | 68 |
| Title | 66 | 10 | .. | .. | .. | 76 |
| Subject | .. | 33 | 47 | 50 | 104 | 234 |
| Total | 66 | 77 | 67 | 64 | 104 | 378 |
| Percent | 17.5 | 20.4 | 17.7 | 16.9 | 27.5 | 100.0 |

distinctive; it is unusual to find more than two books with the same title, although the cataloging of multiple editions of the same book can generate several title cards.

The success of using an author approach is dependent upon several factors: how much of the author's name the patron has--last name only or last and first name, how many authors' names are possible candidates (happily, no respondents named "Smith" as an author), and how prolific the object author is. The probability of locating an object book through an author entry appears to decrease with increasing search length; no author entries were located beyond 100 cards.

By contrast, it is seen that subject successes occur at a fairly consistent rate irrespective of the number of cards manipulated. Table 4 illustrates this phenomenon with data relative to total successful searches (Table 3). Success in locating subject entries may be strongly dependent upon perseverance--the patron must be willing to keep trying until he locates the appropriate heading either through his own knowledge or through following a chain of cross-references, often a discouraging process.

TABLE 4

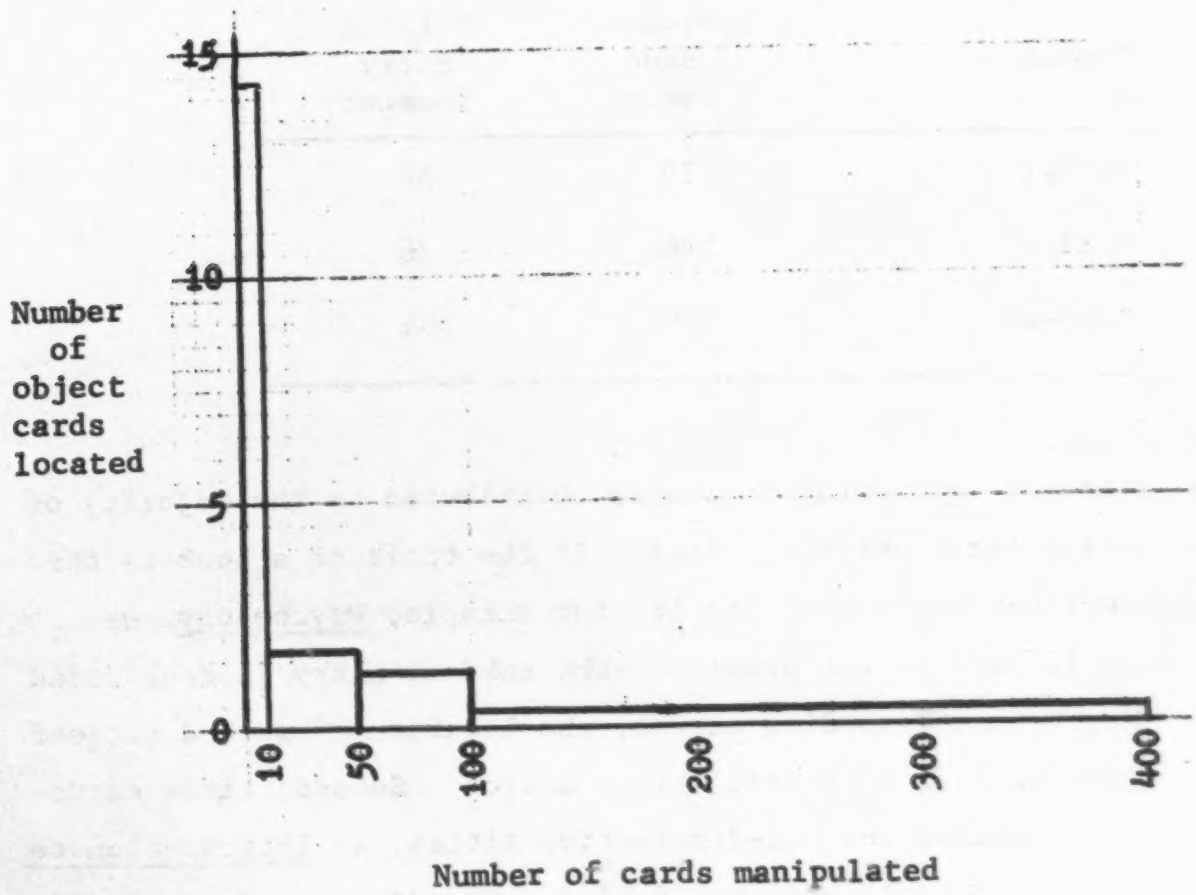
DISTRIBUTION OF SUCCESSFUL SUBJECT SEARCHES BY NUMBER OF CARDS MANIPULATED

| Number of Cards | Number of Successes | Percentage of Successes |
|---|---|---|
| 2-10 | 33 | 14.1 |
| 11-50 | 47 | 20.1 |
| 51-100 | 50 | 21.4 |
| 100+ | 104 | 44.4 |
| Total | 234 | 100.0 |

Figure 1 portrays graphically the rate of success in locating object catalog cards as a function of the number of cards manipulated. All approaches--author, title, and subject, are included. The categories Direct and 2-10 have been combined (refer to Tables 2 and 3); the category 100+ has been arbitrarily defined as averaging 300 cards, probably a conservative estimate, since many searches involved manipulating 1,000 cards or more. It is seen that the success rate decreases sharply as the number of cards increases; thus if a library patron has fairly accurate information, usually author or title, about the particular work for which he is searching, he usually does not have to consult an inordinate number of cards. However, if information is incomplete or non-specific, as in the case of a significant amount of subject information, a longer search is likely to be required.

FIGURE 1

LOCATION OF OBJECT CARDS AS A FUNCTION OF SEARCH LENGTH



It has been pointed out that the shorter searches (fewer than 100 cards) are usually for author or title entries; the longer ones (over 100 cards) are for subject entries only.

It is interesting as well as informative to compare the quality of responses regarding author, title, and subject information elicited in the book-memory experiment to the results obtained in the catalog search. One would expect that the two "success rates" be similar. Data presented in Table 5 permits comparison of these two performances.

The immediately apparent discrepancies indicate that catalog performance falls short of its potential. Failure to locate in a catalog an entry which had been accurately stated may be due to a number of causes: catalog failures, as misfiling, absence of a critical entry; searcher failures; and common cataloging practices.

TABLE 5

CATALOG USEFULNESS OF RESPONSES ELICITED IN BOOK-MEMORY EXPERIMENT

| Approach | Response Judged Correct | Catalog Entry Located |
|---|---|---|
| Author | 70 | 68 |
| Title | 100 | 76 |
| Subject | 333 | 234 |

Two standard cataloging practices contributed to the majority of failures to locate title entries. First, if the title of a book is the same as a subject heading applied to it, for example, Psychology, or Hypnotism, a title card is not provided--the subject entry is considered to take priority. In the catalog search, the location of such a subject card was not counted as a successful title search. Second, title cards are normally not provided for non-distinctive titles, as Introduction to Psychology; thus, such title searches failed. In addition, a number of

title cards were never located because, inexplicably, they simply had not been provided.

Searches in pursuit of subject entries were the most frustrating of all. First, in spite of libraries' attempts to keep the number of entries at any given catalog access point to a minimum, there are single subject headings extending over as many as 600 cards; when subdivisions of a single subject heading are included, often as many as 2,500 cards are indicated. For example, the heading CHILD STUDY, subdivided into three sections by date of publication, covers 1,550 cards. Form and content subdivisions, e.g., PSYCHOLOGY--ADDRESSES, ESSAYS, LECTURES; PSYCHOLOGY--COLLECTIONS, and PSYCHOLOGY, HISTORY (to name only a few) force the patron to familiarize himself with the system and to formulate his subject specification quite accurately. Information given on search memos frequently was not adequate to locate even an appropriate subject heading, much less the object entry. Second, the catalog's syndetic structure of cross references provides patrons assistance in getting from an incorrect to a correct subject heading. In the case of "see" references, this aid is valuable; in the case of "see also" references, the patron, confronted with a list of possibly twenty alternative headings to consult, may give up in despair.

The group of 128 search memos that yielded no catalog search successes under any approach was analyzed for the cause of failures. The most common cause of author-or-title-approach failure was the complete absence of any information; if incorrect author or title information was given, no method of manipulating that information in order to make it operative in catalog searching is available. Subject information, on the other hand, has a greater possibility of being functional, since theoretically, at least, a vague subject specification may, through the cross-reference system, lead ultimately to the object entry. Since in only two of the 128 cases no subject description was given, 126 attempts to locate subject entries were fruitless. Analysis showed that the most common causes of subject-search failure were (1) heading specified was too broad or general (forty cases), (2) heading specified was grossly inaccurate (thirty-nine cases), (3) critical entries were misplaced

in the catalog (twenty-three cases), and (4) searcher failed to locate an existing catalog card (eighteen cases). Of these four leading causes of subject failures, the first two reflect human cognitive errors; the latter two, human manipulative errors. Failures due to this latter type of error presumably could be completely eliminated in a mechanized retrieval system, as could time-consuming and frequently ineffective lengthy subject searches through a maze of cross-references.

## Summary

Using information provided by respondents in the Book-Memory experiment, a catalog search was conducted. Nearly 71 per cent of respondents had provided author, title, or subject information that was accurate enough to locate object books in the card catalog. Subject heading approaches provided the greatest number of successful searches--over half of the object books could be located through this approach. Less than 20 per cent of object books could be located through title approaches; 15 per cent through author approaches.

The catalog search yielded several noteworthy observations. First, the rate of success over all approaches declines as the number of cards manipulated increases. Author and title searches, however, account for the majority of successes within a small number of cards; subject searches involve much larger numbers of cards. Second, except for a complete and accurate citation, title approaches afford the most efficient access to specific books, since titles tend to be unique specifications. Finally, certain cataloging practices and human errors account for a significant number of search failures, thus card catalogs are prevented from functioning at their potential level of effectiveness.

## ACCURACY AND UTILITY OF SUBJECT-RELATED RESPONSES

Dorothy A. Day

In the book-memory experiment, experimentees were given three opportunities[1] to provide information pertinent to subject headings: at Stage I (card) they were asked to give anything they could remember about the book; at Stage II (checklist question 5) they were asked to describe the subject of the book "as specifically as you can in a few words." Approximately half-way through the experiment, when the data had been accumulated in sufficiently large amounts to determine some problems, it appeared that these two sources provided highly unstructured, rambling responses from which phrases would have to be extracted--hence introducing an element of subjectivity on the part of the person extracting these phrases. Therefore the remaining experimentees (accounting for 192 of the 440 responses) were requested, after completing the questionnaire, to tell what subject heading they would consult in Harper catalog[2] to find the book (stage II(3a) or SH question). The responses to this question were on the whole brief and required no further manipulation to be used for purposes of analysis. Since no restraint was put on the number of headings given, a single response could provide as many as ten headings; the average number was between two and three headings per response.

For those responses presented in a rambling form, key words or phrases were extracted and listed for each response. These extracted phrases, plus the responses which were usable in the form given, were then compared with:

(1) the subject headings actually used for each book as traced on the card in Harper catalog, and

---

[1]See questionnaire and instruction sheets in Appendix A.

[2]The comprehensive public catalog of the University of Chicago Libraries, located in Harper Library.

(2) the cross references (see and see also) given to each of these headings in the seventh edition of the Library of Congress list of subject headings.

Matches or near matches were tallied in the following categories:

A. COMPLETE HEADING GIVEN

OK: heading given matched perfectly with correct heading or cross-reference

2. FORM: heading given was a form variation of the correct heading or cross-reference

a. P/S: plural-singular variation (e.g., allergy vs. allergies)

b. AB: abbreviated form given by respondent (e.g., correct form psychology/respondent gave psych.)

c. SP: spelling error in form given by respondent (e.g., correct form fairies/respondent gave faeries)

d. OTHER FORM: some other form variation (e.g., correct form hypnotism/respondent gave hypnosis)

3. INV: inverted form given by respondent (e.g., correct form child study/respondent gave study of child)

B. PARTIAL HEADING GIVEN (first part of heading correct or nearly so)

NS: no subheading given by respondent (e.g., correct form psychology--history/respondent gave psychology; correct form thought and thinking/respondent gave thought)

2. WS: subheading given by respondent was wrong (e.g., correct form psychology--history/respondent gave psychology--religion)

For both of these categories (NS and WS):

a. MOK: main part of heading correct

b. MP/S: plural-singular variation of main part of heading

c. MAB: abbreviated form of main part of heading given

d. MSP: spelling error in main part of heading

e. M FORM: some other form variation in main part of heading

These headings were called "usable" for finding the book. Our 440 respondents provided 491 such headings. The remaining headings given (those not

falling into one of the above categories) were not analyzed.[1]

In contrast to other book features tested in the experiment, results on subject headings were extremely good. Of the 440 respondents, only two failed to provide some sort of subject information; of the remaining 438 respondents, 333 provided information judged "usable" (falling in the above categories) for finding the book by subject approach--over 75 per cent of the respondents.

TABLE 1

RESPONDENTS GIVING USABLE HEADINGS

(All data)

| | | |
|---|---|---|
| No usable headings | | 105 |
| At least one usable heading | | |
| At least one direct | 171 | |
| At least one cross-reference | 93 | |
| At least one of each | 69 | |
| Total | | 333 |
| Null | | 2 |
| Total | | 440 |

In respect to this finding, some remarks should be made. First, classification of a subject as "usable" sometimes assumes unlimited patience on the part of the patron in dealing with the catalog, for it includes anything which can be traced, directly or through cross references, to the actual subject heading used, and assumes ploughing through all cards under that heading until the exact card is hit upon. This can sometimes involve upwards of 600 cards under one heading alone, and up to twenty cross references to be checked.

Separate data was also kept for the persons asked to give a specific subject heading for the book (SH question):

---

[1]Only a careful estimate can be made of the total number of headings actually given by experimentees, because "headings" often had to be extracted from phrases and frequently involved the staff's judgment as to what qualified as a heading. The figure arrived at by this process is 1,173 headings for our 440 respondents.

TABLE 2

RESPONDENTS GIVING USABLE HEADINGS

(SH question)

| | | |
|---|---|---|
| No usable headings | | 51 |
| At least one usable heading | | |
| At least one direct | 57 | |
| At least one cross-reference | 56 | |
| At least one of each | 23 | |
| Total | | 136 |
| Null | | 5 |
| Total | | 192 |

Of the 192 such responses, five failed to provide any heading, and 136 provided at least one usable heading (71 per cent of those asked). While differing somewhat in nature from the data extracted from the other two sources, this data gives a figure quite close to the first (76 per cent).

The figures above are for responses the experimentees gave for each book, representing whether the responses provided at least one usable heading in each case. Many of our experimentees gave several responses, frequently providing more than one usable heading for each book:

TABLE 3

RESPONDENTS GIVING USABLE HEADINGS

(All data)

| | | |
|---|---|---|
| No usable headings | | 105 |
| At least one usable heading | | |
| One | 210 | |
| Two | 95 | |
| Three | 24 | |
| Four | 3 | |
| Five | 1 | |
| Total | | 333 |
| Null | | 2 |
| Total | | 440 |

TABLE 4

RESPONDENTS GIVING USABLE HEADINGS

(SH question)

| | | |
|---|---|---|
| No usable headings | | 51 |
| At least one usable heading | | |
| One | 87 | |
| Two | 45 | |
| Three | 4 | |
| Total | | 136 |
| Null | | 5 |
| Total | | 192 |

Overall, 123 of the respondents provided two or more usable headings (28 per cent of the 440). On the subject heading question, forty-nine of the 192 gave two or more usable headings (25.5 per cent).

Of the persons giving at least one usable heading, 123 of 333 gave more than one usable heading (37 per cent); for the SH question, forty-nine of 136 such respondents gave multiple usable headings (36 per cent). This would seem to indicate that at least when specifically asked for a subject heading, there is some tendency to give multiple usable points of access to the book. A retrieval system which took advantage of such multiple points of access would hence greatly increase the findability of the book.

Of the 491 usable headings given by our 440 respondents, there is a rather strong tendency to exact matches:

TABLE 5

USABLE COMPLETE HEADINGS[1]

| | Exact match | Form var. | INV | Total |
|---|---|---|---|---|
| Direct | 151 | 25 | 7 | 183 |
| Cross-ref. | 115 | 16 | 3 | 134 |
| Total | 266 | 41 | 10 | 317 |

TABLE 6

USABLE PARTIAL HEADINGS[1]

| | MOK | M Form var. | Total |
|---|---|---|---|
| Direct | 79 | 22 | 101 |
| Cross-ref. | 62 | 11 | 73 |
| Total | 141 | 33 | 174 |

[1]For explanation of abbreviations, see p. 2.

Of 317 usable complete headings, direct or cross-reference, 266 were exact matches (84 per cent). This may be partially accounted for by the fact that many headings are one word. Of 174 usable partial headings, 141 have the main part of the heading correct (81 per cent). Among the variations allowed as "usable", none significantly distorts the heading in findability; all are close enough to the correct heading once in the catalog. The data is partly distorted by the categories imposed; if the heading given in the response were very far off, it would not be usable in the present catalog. However, it is surprising to see so many exact matches from our 440 respondents.

There remains the extremely interesting study of the content of the subject headings given by the experimentees. Quite often the experimentee gave a heading which, in the judgment of the staff, accurately described the subject of the book, yet was not used as a heading for that book in Harper catalog. Under the present catalog, this information is useless. Careful study of the headings given might suggest possible improvements for the present catalog's subject heading system and also directions any other retrieval system might take.

Another possible area of exploration would be the study of the relation between the subject of a book and its title, particularly where the title is an "informative" one. Preliminary study, reported elsewhere in this set of papers (see "Title, Subtitle and Table of Contents as Sources of Index Words"), seems to indicate that even when an experimentee could not give a correct title when asked, his subject response usually contained key words from the actual title, subtitle, or chapter headings.

Supplementary data detailing the nature of subject headings provided by experimentees is presented in the appendix following.

# APPENDIX[1]

## TABLE A

## USABLE RESPONSES BY TYPE OF HEADING

### Complete Headings

| | OK | P/S | AB | SP | OTHER FORM | INV | Total |
|---|---|---|---|---|---|---|---|
| Direct | 151 | 11 | 3 | 2 | 9 | 7 | 183 |
| Cross-ref. | 115 | 6 | .. | .. | 10 | 3 | 134 |
| Total | 266 | 17 | 3 | 2 | 19 | 10 | 317 |

### Partial Headings

#### No Subheading

| | MOK | MP/S | MAB | MSP | M FORM | Total |
|---|---|---|---|---|---|---|
| Direct | 50 | 5 | 1 | .. | 7 | 63 |
| Cross-ref. | 28 | .. | .. | .. | 2 | 30 |
| Total | 78 | 5 | 1 | .. | 9 | 90 |

#### Wrong Subheading

| | MOK | MP/S | MAB | MSP | M FORM | Total |
|---|---|---|---|---|---|---|
| Direct | 29 | 5 | .. | 1 | 3 | 38 |
| Cross-ref. | 34 | 1 | 1 | .. | 7 | 43 |
| Total | 63 | 6 | 1 | 1 | 10 | 81 |

[1] For explanation of abbreviations in headings, see page 2.

TABLE B

USABLE RESPONSES BY CLASS OF RESPONDENT

Complete Headings

Direct

| | OK | VAR | Total |
|---|---|---|---|
| Categ. 1 | 101 | 16 | 117 |
| Categ. 2-5 | 50 | 16 | 66 |
| Psych. people | (26) | (3) | (29) |
| Total | 151 | 32 | 183 |

Cross-reference

| | OK | VAR | Total |
|---|---|---|---|
| Categ. 1 | 58 | 12 | 70 |
| Categ. 2-5 | 57 | 7 | 64 |
| Psych. people | (20) | (2) | (22) |
| Total | 115 | 19 | 134 |

Partial Headings

No Subheading

Direct

| | MOK | MVAR | Total |
|---|---|---|---|
| Categ. 1 | 23 | 2 | 25 |
| Categ. 2-5 | 27 | 11 | 38 |
| Psych. people | (13) | (4) | (17) |
| Total | 50 | 13 | 63 |

Cross-reference

| | MOK | MVAR | Total |
|---|---|---|---|
| Categ. 1 | 16 | .. | 16 |
| Categ. 2-5 | 13 | 3 | 16 |
| Psych. people | (2) | .. | (2) |
| | 29 | 3 | 32 |

Wrong Subheading

Direct

| | MOK | MVAR | Total |
|---|---|---|---|
| Categ. 1 | 20 | 6 | 26 |
| Categ. 2-5 | 9 | 3 | 12 |
| Psych. people | (4) | (1) | (5) |
| Total | 29 | 9 | 38 |

Cross-reference

| | MOK | MVAR | Total |
|---|---|---|---|
| Categ. 1 | 21 | 6 | 27 |
| Categ. 2-5 | 13 | 3 | 16 |
| Psych. people | (3) | (3) | (6) |
| Total | 34 | 9 | 43 |

---

[1] For explanation of categories, see page 10 of main report and "Evaluation of Variations of Response Patterns of Psychology and Non-Psychology Students for all Characteristics."

TABLE C

USABLE RESPONSES BY SOURCE OF HEADINGS[1]

Complete Headings

Direct

| | OK | P/S | AB | SP | OTHER FORM | INV | TOTAL |
|---|---|---|---|---|---|---|---|
| Card | 30 | 4 | .. | .. | 2 | 5 | 41 |
| Question 5 | 80 | 3 | 3 | 1 | 6 | .. | 93 |
| SH Question | 41 | 4 | .. | 1 | 1 | 2 | 49 |
| Total | 151 | 11 | 3 | 2 | 9 | 7 | 183 |

Cross-reference

| | OK | P/S | AB | SP | OTHER FORM | INV | TOTAL |
|---|---|---|---|---|---|---|---|
| Card | 21 | 1 | .. | .. | 2 | 1 | 25 |
| Question 5 | 40 | 5 | .. | .. | 5 | 1 | 51 |
| SH Question | 54 | .. | .. | .. | 3 | 1 | 58 |
| Total | 115 | 6 | .. | .. | 10 | 3 | 134 |

Partial Headings (NS and WS combined)

Direct

| | MOK | MP/S | MAB | MSP | M FORM | TOTAL |
|---|---|---|---|---|---|---|
| Card | 14 | 2 | .. | .. | 4 | 20 |
| Question 5 | 29 | 4 | 1 | 1 | 6 | 41 |
| SH Question | 36 | 14 | .. | .. | 0 | 40 |
| Total | 79 | 10 | 1 | 1 | 10 | 101 |

Cross-reference

| | MOK | MP/S | MAB | MSP | M FORM | TOTAL |
|---|---|---|---|---|---|---|
| Card | 7 | .. | .. | .. | 1 | 8 |
| Question 5 | 18 | .. | 1 | .. | 4 | 23 |
| SH Question | 37 | 1 | .. | .. | 4 | 42 |
| Total | 62 | 1 | 1 | .. | 9 | 73 |

[1]For explanation of sources, see p. 1.

# AN ANALYSIS OF NON-EXACT TITLE DATA

William A. Hinkley

Library users, wishing to retrieve a specific work known by them to exist, can enter the card catalog as it now exists with author, title, or subject information. The subject heading is an addition made by the subject cataloger to a given book, but the author-title citation is an integral part of the book and essentially unique to it. It can be remembered through rote memory without any intervening concept-formation process. If the user must rely on his memory of previous exposure to the desired book, it is not unlikely that he has faulty and imprecise information about the details of the author-title citation.

In the experimental situation described above, experimentees were asked to recall what they could about the books they had seen at an earlier time. Very few experimentees (20.9 per cent) offered any author information, but when they did, they were usually correct. Most experimentees (82.7 per cent) offered title responses, but only a small percentage of them (22.7) were word perfect. Since only a few experimentees offered inexact author information, there is little potential for improvement of retrieval by author. However, a substantial percentage of experimentees thought they remembered and consequently offered non-exact title responses. This situation suggests that a close analysis of non-exact title responses be carried out to determine how many of them are partially correct and potentially useful.

There are several ways in which this non-exact information might be utilized. It will be important to keep these methods in mind as the data are analyzed. A concordance entry to the individual words in titles could be provided by a permuted title list or by added entries in the existing card catalog for individual words in titles. A title catalog

stored in machine readable form could be searched with the specification that certain remembered words co-occur in the retrieved title.

The following analysis will concern itself with what is remembered correctly in non-exact responses. The utility of this remembered information is influenced by several other important but separate considerations. For example, there might be too many entries at one alphabetical word position in a permuted title list or card catalog with added title word entries. Further, the retrieval value of extra title word entries might be canceled out by the bulk addition to the size of a card catalog or permuted list. Although these questions should be considered when assessing the potential utility of non-exact responses to the correct title, they are separate from an evaluation of book title memorability, and are not dealt with in this paper.

Non-exact title responses which were experimentally derived can be used as simulated queries to a real card catalog, or to any improved retrieval system using concordance or coordinate access. To evaluate the usefulness of these non-exact queries, it will be first necessary to determine how many exact titles are retrievable from a current card catalog, when it is entered with this non-exact information. Two assumptions must be made. First, it must be assumed that users can recognize the correct title once their non-exact query has allowed them to narrow the search to a few titles. There is evidence to suggest that this is reasonable. Seventy-seven per cent of the experimentees in the book-memory experiment were able to recognize from long author-title citation lists the citations for the books that they had seen before.

Secondly, the arrangement of the card catalog must be considered in order to determine the minimum information that is required to locate items in it successfully. There is no easily specified minimum information requirement for access to the alphabetical file of the card catalog. This minimum is a function of file size, number of entries under one word, and the number of cards a user will want to search. Consequently, it is necessary to make the following general assumption.

If the first two words of a non-exact query correctly match the first two words in the title sought, then it is assumed here that the

query contains enough information for retrieval. Queries meeting this condition will have, by definition, a high retrieval value. Retrieval can probably also take place if the first word of the query matches exactly the first word of the desired title, but in this case the task is more difficult. There will be more entries to go through and more confusion will result from the fact that titles are not in a separate file but interspersed with author and subject entries. Queries which meet the first word match condition will be said to have low retrieval value.

The group of queries with low retrieval value is also defined to contain some even less exact queries. If the first five letters of the first word of the query match the first five letters in the first word of the title, the query was counted as having a low retrieval value. The library user would have to search through an even larger file than in the above cases but the recognition assumption would probably assure retrieval. The sixteen queries that had five-letter low retrieval value differed in their first words from the first words in the exact title by only slight variations in grammatical endings. On only one occasion did the first query word differ significantly from the correct one. The experimentee offered "autocontrol" in response to the correct word "autoconditioning." Thus mistakes in the first word, if they are made, are probably either complete word changes or very nearly correct.

Table 1 shows the distribution of retrievable responses broken down by the number of words in the exact title. First, the table shows certain facts about the sample. There is a preponderance of short titles, five words or less. The sample was made up of monographs in psychology which traditionally have shorter titles than journal articles or reports. There are a fair number of titles in each "number of words" category. The modal title length was three words with titles of one, two, four, and five words each occurring about one-half as frequently. There are approximately three responses for each title in the sample.

It should be noted from Table 1 that there are 446 responses, which figure does not include seventy-eight occurrences of the null response, that is an empty response to the question, "What is the title

of the book?" Because of the format of the questionnaire, some experimentees gave two responses to the title if they thought their first guess was incorrect. Each of these responses was treated as a separate response. It was assumed that each non-exact response was a separate problem for the interrogated file, whether or not it came from one person. There are approximately eighty double responses in the 446 responses tallied.[1]

TABLE 1

DISTRIBUTION OF CONVENTIONALLY RETRIEVABLE RESPONSES BY NUMBER OF WORDS IN THE CORRECT TITLE

| Retrieval Utility of Responses | Number of Words in Title[a] | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | 1 (15) | 2 (21) | 3 (40) | 4 (25) | 5 (20) | 6 (4) | 7 (3) | 8 (6) | |
| Exact title match | 20 | 24 | 25 | 19 | 3 | 1 | - | - | 92 |
| High retrievability (first two words) | - | - | 6 | 12 | 3 | 4 | - | 3 | 28 |
| Low retrievability (first word) | 10 | 7 | 8 | 5 | 9 | 2 | - | 1 | 42 |
| No retrieval value | 20 | 45 | 87 | 64 | 39 | 2 | 4 | 23 | 284 |
| Total | 50 | 76 | 126 | 100 | 54 | 9 | 4 | 27 | 446 |

[a]Numbers in parenthesis indicate the number of titles in each word-length category in the sample.

Table 1 shows the number of responses that were word perfect in each "number of words" class. Responses to titles with only one word were

[1]Data was gathered for this analysis before final verification of the data base. Consequently this analysis differ from the final tallies reported above in one or two cases.

word perfect in 40 per cent of cases (20/50); 33 per cent of responses to titles with two words were word perfect; 20 per cent of responses to titles with three and four words were word perfect. A much smaller percentage of the responses to titles with five or more words are exact but the numbers in the sample are small. As might be expected the chance for error goes up sharply as the number of words in the title increases and the added complexity taxes memory more.

Table 1 also shows the seventy non-exact responses having high or low retrieval value. Thus 19.5 per cent (70/354) of all non-exact title responses are retrievable from the conventional card catalog. When this figure is added to the ninety-two correct responses we have 162 responses that are retrievable. This figure is 36 per cent of the total number of exact and non-exact responses in the experimental data. It is 31 per cent of all responses including null responses. Thus, approximately one-third of the time, the response to the question, "What is the title of the book you saw?" is retrievable from a conventional catalog.

The responses with high and low retrieval value have several characteristics worth noting. Of the twenty-eight responses with high value, eighteen match the first two words of the correct title, the minimum number for the "high" designation. The remaining ten responses match the first three words, and none match the first four or more words. The forty-two responses with low retrieval value include sixteen responses that were not exact matches in their first words, but were at least five-letter matches. Six of these five-letter matches were in response to one word titles. Two of these responses were exact matches to three word titles except for a variant in the last syllable of the first word.

Up to this point the central concern has been retrieval from a conventional card catalog using non-exact title information. In order to evaluate the worth of non-exact title information when used with a permuted title list or computer coordinate search of the complete title text of a book catalog, it will be necessary to change some of the above assumptions. The first assumption, that users can recognize a title they had seen before from a short list of titles, will hold. The second assumption must be changed, however. Retrieval can take place with these new

file arrangements and access methods if the user remembers correctly any words in the title; the requirement that he remember the first word of the title, which can be called a positional requirement, no longer holds. Specific assumptions about how much of a non-exact response must be correct for retrieval are beyond the scope of this paper and will not be made. Instead the following analysis will demonstrate a number of observations about the qualities and quantities of memory in non-exact responses.

First it will be necessary to show how many words in each non-exact response exactly match words occurring in the correct title. Table 2 divides the 446 exact and non-exact responses according to (1) the number of words in each response that exactly match the title words, and (2) the number of words in the correct title. The distribution of the seventy responses retrievable from a conventional card catalog is also included. The notation gives the number of non-exact responses retrievable followed by an "L" or "H" to indicate high or low retrieval value.

TABLE 2

DISTRIBUTION OF RESPONSES BY THE NUMBER OF WORDS IN EACH RESPONSE THAT EXACTLY MATCH TITLE WORDS AND BY NUMBER OF WORDS IN THE CORRECT TITLE

[Distribution of high (H) and low (L) valued responses]

| No. of Words in Response Exactly Matching Title Words | Number of Words in the Title | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 0 | 21 | 23 | 45 | 18 | 14 | 1 | | 5 |
| 1 | 29 (10L) | 26 (7L) | 31 (4L) | 34 (5L) | 12 (2L) | | 2 | 9 (1L) |
| 2 | | 27 | 19 (3H) (2L) | 16 (3H) | 13 (2L) | | 1 | 2 |
| 3 | | | 31 (3H) (2L) | 12 (9H) | 4 (1H) (2L) | 3 (1H) (1L) | 1 | 5 |
| 4 | | | | 20 | 7 (1H) (2L) | 3 (3H) | | 2 (1H) |
| 5 | | | | | 4 (1H) (1L) | 1 (1L) | | 3 (1H) |
| 6 | | | | | | 1 | | 1 (1H) |

Table 3 demonstrates the change in matching performance when matches on the words "of," and "and," and "the" (when not the first word in the title) are subtracted from Table 2. It is obvious that these words are of little retrieval value in concordance-type access. They are very frequent in title text. These easy and useless matches seldom occur in one and two-word titles; syntax prevents it. There are a large number of these matches in the three-word titles because of the frequency of the title constructions, (noun) and (noun); (noun) of (noun). Therefore the thirty-one one-word matches reported in Table 2 under the three-word title column is reduced in Table 3 by thirteen of-and-the matches. The nineteen two-word matches are reduced by fourteen of-and-the matches, although the of-and-the might be of some retrieval use once the main word had been discovered.

TABLE 3

DISTRIBUTION OF RESPONSES BY NUMBER OF INTERNAL MATCHES MINUS OF-AND-THE MATCHES

| No. of Words (not of-and-the) Exactly Matching Title Words | Number of Words in Title | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 0 | 21 | 23 | 58 | 19 | 15 | 1 | | 9 | 146 |
| 1 | 29 | 26 | 32 | 44 | 15 | | 2 | 6 | 154 |
| 2 | | 27 | 8 | 12 | 13 | 2 | 2 | 3 | 67 |
| 3 | | | 28[a] | 6 | 6 | 4 | 0 | 5 | 49 |
| 4 | | | | 19[a] | 2 | 1 | | 3 | 25 |
| 5 | | | | | 3[a] | 0 | | 1 | 4 |
| 6 | | | | | | 1[a] | | | 1 |

[a]Match on of-and-the not subtracted if response was word perfect.

It is immediately apparent from Table 3 that a large number of titles contain zero or one matches. There are 146 zero matches including nineteen one-word of-and-the matches. There 154 responses with one-word

matches including the two-word matches with one of-and-the and the twenty correct responses to one-word titles. There are 146 responses with at least two good matches, of which seventy-two are correct responses. Therefore, of the 354 non-exact responses, 41 per cent (146) contain zero exact and good matches, and 59 per cent (208) contain one or more. Twenty per cent (74) of all non-exact responses contain at least two good word matches. However, forty-one of these responses are retrievable because they contain positional information, i.e., stating correctly the first word or first two words of the title.

Table 4 divides the experimentally derived responses into categories of their usefulness when applied to several retrieval situations. The percentage breakdown of non-exact responses is given at the right. Twenty per cent of the responses are retrievable from an existing card catalog under the assumed retrieval specifications outlined above. Forty per cent contain no internal matches, i.e., no response words matching words in the correct title. Forty per cent contain one or more internal matches, but only one-fourth (33/138) of these contain more than one internal match. This fact somewhat invalidates arguments for a computer search of a title list with a retrieval specification that two words from the response co-occur in the retrieved title. Some of the responses in the retrievable category (II) contain two or more internal matches but there would be little point in searching for them

TABLE 4

DISTRIBUTION OF NON-EXACT RESPONSES

| | Number | | Percentage | |
|---|---|---|---|---|
| I. Retrievable from card catalog | | | | |
| First two words correct | 28 | | 7.8 | |
| First word correct | 26 | | 7.4 | |
| First five letters correct | 16 | | 4.4 | |
| | | 70 | | 19.6 |
| II. Not retrievable from card catalog | | | | |
| One-word match[a] | 105 | | 29.6 | |
| Two or more word match[a] | 33 | | 9.4 | |
| No match | 146 | | 41.4 | |
| | | 284 | | 80.4 |
| | | 354 | | 100.0% |

[a]Does not include a match on of-and-the.

by computer when they are already retrievable with a conventional card catalog.

Constructing retrieval specifications for a coordinate search would be further complicated by the fact that it would be difficult to identify which words in the response were correct match words. Table 5 demonstrates the number of responses containing superfluous words. Each boxhead indicates the number of responses in each match category; the column below it the number of responses containing more words than the correct title has. In the zero match category, the numbers in the row indicate the number of responses with two or more words. The 127 zero match cases despite complete failure at matching were able to elicit ninety-eight responses with at least two words. The shorter titles seem to elicit more responses with superfluous words than the longer titles. However, overall, there are relatively few responses containing more words than their correct titles.

TABLE 5

DISTRIBUTION OF RESPONSES CONTAINING AT LEAST ONE MORE WORD THAN IN CORRECT TITLE

| Number of Words in Response Exactly Matching the Title | Number of Words in Title | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 0[a] | 12 | 20 | 33 | 16 | 12 | | | 5 | 98 |
| 1 | 9 | 12 | 4 | 3 | | | | | 28 |
| 2 | | 3 | 2 | | 1 | | | | 6 |
| 3 | | | 3 | | | | | | 3 |
| 4 | | | | 1 | 4 | | | | 5 |
| 5 | | | | | | | | | - |
| 6 | | | | | | | | | - |
| Total | | | | | | | | | 140 |

[a]In the zero match category, the number indicates responses with two or more words.

# TITLE, SUBTITLE AND TABLE OF CONTENTS AS SOURCES OF INDEX WORDS[1]

Neil A. Radford

Generally speaking, author, title and subject are the three possible approaches to using the contents of a library catalog, and it has always been assumed that the catalog user will be able to specify at least one of these. Every reference librarian has encountered the problem of the reader who has used a particular non-fiction book in the library before and now wishes to see it again, but has completely forgotten its author and title. In such a case the librarian usually assists the reader in a subject-oriented search at the catalog or in an appropriate bibliography, and in all but the smallest libraries, a considerable amount of time is spent plodding through the various subject entries, hoping to see a likely-looking author or title.

With present library cataloging practice, a title approach is possible only if the user has accurate knowledge of the whole title or at least the first part of it, and a subject approach is usually considered to be potentially more fruitful when the title cannot be remembered because the reader at least knows the subject matter of the book in a general way, and can often define it more specifically under questioning from the librarian. What seems seldom to be realized is that because the majority of non-fiction books have titles which are closely tied to their subject matter, it is possible that, in being questioned about the book's subject, the forgetful library user might be able to recall enough significant title words (without realizing it) to permit a faster and more fruitful catalog search by title.

---

[1]The experiment reported here was originally carried out as an exercise in computer programming, rather than an experiment in retrieving previously seen books by means of index words taken from their titles, subtitles and tables of contents.

Several points arise here. To what extent is such questioning likely to bring forth significant words from the title? Further, to what extent is it likely to bring forth words from other parts of the book which, although not presently indexed in the library's catalog, could conceivably be handled in a mechanical system to improve the chances of retrieval by a subject approach?

The Graduate Library School of the University of Chicago has recently completed an experiment designed to discover what additional characteristics of books, besides those presently included in library catalogs, could be added to the catalog entry to facilitate retrieval of wanted materials which have been previously consulted, and the data collected allow some conclusions to be made respecting the specific points raised in the preceding paragraph. The details of the experiment are described in "Memorability of Book Characteristics: An Experimental Study," but are presented here briefly. A number of participants were asked to select several books which interested them from a controlled collection drawn from the University Library's psychology section, and to examine these books and write comments about them. Without being told the reason for the experiment, the participants were asked to return two weeks later, at which time they were requested to write down everything they could remember about the books they had previously consulted. Thus their recollections are probably quite close to those of a library patron who reads a book which interests him, without expecting to need it again, and later comes back seeking the same item. Among other things, participants in the second, or "recall," stage of the experiment were asked to write down the author and title of each of the books they had previously examined, or, if the exact author and title could not be remembered, then as much of them as they could manage. They were also asked to write down the subject headings under which they would look in the Library's catalog if they were trying to find the book concerned, and it was this information which made possible the study reported here.

The records of responses were examined and those instances in which the participants were completely unable to remember anything about the books' titles but had given one or more subject headings, were selected.

All responses pertaining to books with the word "psychology" in their titles, or responses including the word "psychology" as a subject heading were excluded from this selection on the grounds that, as the experimental collection was drawn from the Library's psychology collection, all the books in it came under the very broad heading of "psychology," and this general term would not be a useful means of identifying or retrieving a specific book. An additional few responses were also excluded from the analysis because the books to which they pertained were not immediately available for inspection.

The twenty-four responses finally selected covered, in all, twenty different books. These twenty books were then examined, and what might best be called "key words" were noted down from their titles, subtitles and contents pages. Generally speaking, the words recorded for each book comprised all nouns from the title and subtitle (if any) and all important nouns or ideas from the list of contents. Some discretion had to be used in selecting words from the contents lists of a few books which defined in great detail what each chapter and each section of each chapter was concerned with, and in a few cases where there were literally dozens of possible words, none of which corresponded with the subject words given by the respondent, all were ignored for the sake of simplicity. This may have reduced the number of incorrect matches in the course of the experiment, but the number of correct matches was not affected because the words omitted did not correspond with the words specified by those respondents who were attempting to retrieve the books in question, so no match would have been made anyway.

One other comment on the nature of the index words needs to be made, namely that, for the sake of simplicity again, variations in the form of a word were grouped with the word itself. For example, the words "child," "children," and "childhood" were all converted to the form "child," both in the list of words obtained from the books and in the subject words given by the respondents. This type of "standardization" parallels the real library situation where, to ensure uniformity, a thesaurus such as a subject-headings list determines which words and which forms of words are "permissible" and words from books and words from library patrons have to conform to its rules.

In twenty-one of the twenty-four searches, the matching of index words with response words resulted in retrieval of the author and title of the book which the experiment participant had been trying to recall. In other words, in 88 per cent of the searches, matching the subject words remembered by the participants in the experiment with actual words taken from the titles, subtitles and/or lists of contents, resulted in the correct books being found, even though the participants claimed to be quite unable to remember anything at all concerning these features of the books, and had given these words in response to a request for subject headings. Although the sample size was small, a 95 per cent confidence interval constructed around the results gives a range of between 67 per cent and 97 per cent, which means, roughly, that the odds are twenty to one against the possibility that the true percentage, which would have been obtained by increasing the sample size indefinitely, lies outside this range. Therefore, although this confidence interval may seem a large one, it at least shows that the sample is not so small as to be useless, since it is reasonably assured that in dealing with a vastly larger collection, the percentage of successful searches would be no less than 67 per cent.

In all, the twenty-four searches resulted in a total of sixty-nine books being retrieved, forty of which were "false drops" and twenty-nine correct matches. This last figure is larger than the number of successful searches because of the fact that many of the experiment participants had specified more than one "subject word," which sometimes resulted in the correct book for a particular person being retrieved more than once, as his words were processed in turn. An average of two and one-half different titles were retrieved per search, and if we define the "retrieval rate" as being the percentage of the total collection which was retrieved, we find that the retrieval rate for the experiment averaged 12 1/2 per cent. We may therefore assume that a similar proportion of a larger collection would be retrieved in a process of this nature.

The sources of the index words which led to the twenty-nine retrievals are interesting. Ten, or 34 per cent, were found through

index words taken from the titles of the books, six, or 21 per cent, through index words taken from the subtitles (making 55 per cent for title and subtitle together), and thirteen or 45 per cent, through index words taken from the list of contents.

In an actual library situation using a computer for searching and retrieval, the program could be designed so as to minimize the inconvenience caused by "false drops," by ranking the retrieved citations in order of their likelihood of being the wanted item, based on the number of times they had been found. For example, if four subject words were given by a library user, those citations which matched with all four words would be ranked "most likely," those with three matches would be next in order, and so on. In this way the task of searching a long list of titles with many false drops could be expected to be made easier, since the user could examine the most promising items first.

Two tentative conclusions can be drawn from these results. First, because requests for subject headings will frequently produce words from any part of the title, a permuted title index is likely to be considerably more useful for finding previously seen books than a "traditional" library catalog with title entries, because it permits the user to search on any "key word" in the title. Present library catalogs permit a fruitful title search only if the first important title word is known, and in only two of the twenty-four instances in the experiment were respondents able to give the first important title word, although eight were able to give other important words from the title.

Second, and probably more important, is the conclusion that taking index words only from the title of the book is significantly less successful in retrieving books previously seen than is an index, of whatever kind, which is comprised of "key words" taken from the title, subtitle (if any) and the list of contents. Two-thirds of the successful searches in the experiment for previously seen books owed their success entirely to the inclusion in the corpus of index words, of words taken from the subtitle and/or list of contents of the books concerned.

The added indexing effort is likely to be substantial if these extra sources of "key words" are to be tapped, but on the basis of the results reported here, the increased number of successful searches is so substantial as to warrant serious consideration being given to their inclusion.

## APPENDIX

### THE "INDEX WORDS" AND "REQUEST WORDS" USED IN THE EXPERIMENT

| TITLE AND SUBTITLE | WORDS FROM CONTENTS LIST | RESPONSE WORDS |
|---|---|---|
| Guidance and counseling in groups | Living<br>Learning<br>Vocation<br>Education<br>Personality | Counseling*<br>Psychotherapy<br>Psychoanalysis<br>Illness |
| Rowan tree and red thread: a Scottish witchcraft miscellaney of tales, legends and ballads together with a description of the witches' rites and ceremonies | | Scotland*<br>Witchcraft* |
| A parenthesis in eternity | Mysticism<br>God<br>Reality<br>Illusion<br>Consciousness<br>Mind<br>Spirit<br>Universe | Mysticism*<br>Christianity |
| An application of psychoanalysis to education | Prejudice<br>Perspective<br>Ego | Prejudice*<br>Emotion |
| The ape and the child: a study of enrivonmental influence upon early behavior | | Monkey<br>Child*<br>Anthropology<br>Child* |
| Stolen fire: a study of genius | Eros<br>Prometheus | Genius* |
| Toward understanding human personality | Psychotherapy<br>Life<br>Motivation<br>Child<br>Habits | Personality* |
| Stress situations | Frustration<br>Failure<br>Illness<br>Catastrophe<br>Marriage<br>Fertility<br>Sterility<br>Divorce<br>Death<br>Suicide | Frustration*<br>Failure*<br>Fear<br>Phobia |
| The growth of reason: a study of the role of verbal activity in the growth of the structure of the human mind | Intelligence<br>Child<br>Symbolism<br>Meaning<br>Syntax<br>Abstraction<br>Logic | Logic*<br>Behavior |

*Response words resulting in a successful match with words from title, subtitle or list of contents.

APPENDIX (Continued)

| TITLE AND SUBTITLE | WORDS FROM CONTENTS LIST | RESPONSE WORDS |
|---|---|---|
| Existence: a new dimension in psychiatry and psychology | Existentialism<br>Psychotherapy<br>Phenomenology<br>Schizophrenia<br>Depression<br>Aesthesiology<br>Hallucinations<br>Insanity | Ontology<br>Metaphysics |
| The rape of the mind: the psychology of thought control, menticide and brainwashing | Confession<br>Fear<br>Torture | Brainwashing* |
| Love against hate | Frustration<br>Child<br>Woman<br>Work<br>Play<br>Faith<br>Hope | Faith*<br>Hope*<br>Love*<br>Behavior<br>Adjustment<br>Behavior<br>Play*<br>Recreation |
| Children who cannot read: the analysis of reading disabilities and the use of diagnostic tests in the instruction of retarded readers | | Reading*<br>Education<br>Literacy |
| Myth and guilt: the crime and punishment of mankind | Culture<br>Conscience<br>Memory<br>Science<br>Religion | Guilt*<br>Psychoanalysis<br>Primitive man<br>Guilt*<br>Religion*<br>Superego |
| Extra-sensory perception | Parapsychology | Parapsychology*<br>ESP* |
| Science and human behavior | Reflexes<br>Environment<br>Groups | Behavior*<br>Political science |
| The origin of consciousness: an attempt to conceive the mind as a product of evolution | Body<br>Psyche | Mind*<br>Evolution* |
| Order of birth, parent-age and intelligence | IQ<br>Child<br>Age | IQ*<br>Child*<br>Mental age |
| Inside the black room | Sensory deprivation<br>Abilities<br>Learning | Sensory deprivation* |
| Minor mental maladjustments in normal people: a casebook for the use of students of mental hygiene, psychology, education, child development, sociology, and the formation of personality traits | | Neurosis<br>Trauma |

*Response words resulting in a successful match with words from title, subtitle or list of contents.

# THE POTENTIAL USEFULNESS OF CATALOG ACCESS POINTS OTHER THAN AUTHOR, TITLE AND SUBJECT

William S. Cooper

Most of us have had, at some time or other, the frustrating experience of being able to remember quite vividly the general physical appearance of some book we have read, but of being unable to recall either its author it its exact title. Professors complain that what their students remember best about a textbook is the color of its cover. A book owner is often able to remember what condition one of his books is in, even though its author and title may have for the moment escaped his memory. These commonplace observations suggest that there is often a considerable amount of miscellaneous "nonstandard" information concerning a document which is more memorable to one who has had contact with the document than the "standard" author-title-subject information is. This paper is addressed to the question of whether it might be worthwhile to attempt to make use of such nonstandard information in the design of future library catalogs and retrieval systems.

## 1. Nonstandard Information

Let us agree to use the phrase "nonstandard information" as a cover term for all those types of information about documents which could conceivably be helpful in specifying a wanted document, but which cannot be used to look up a document in the catalogs found in present-day libraries. Since present-day libraries normally provide nothing but author, title, and subject catalogs, this includes virtually all types of data about documents except for author-title-subject information. Data such as the date of publication of a document, its length (number of pages), and an indication of the presence or absence of illustrations in it are usually to be found in present-day catalogs;

but under our definition these must be regarded as nonstandard types of information, for such data cannot be used for lookup purposes as long as catalogs are alphabetized only according to author, title, or subject. Of course, such physical features of a document as its cover color and design are definitely "nonstandard," since they do not appear in today's catalogs in any form.

All nonstandard information represents an as yet untapped resource for aiding the retrieval process. To illustrate the possibilities, suppose that a patron of a library or information center desires a particular document with which he has had previous contact. He may be unable to remember the author or title of his document with the accuracy and completeness needed to look it up in a conventional author-title catalog. He may also be unable to specify the subject area in terms of a heading which would permit a quick lookup in the subject catalog. But it is quite possible that he can nevertheless state with assurance that the document in question is, say, large, green, in good condition, recently published, a translation from the German, and well illustrated. Here is a case where the remembered nonstandard information has the potential for being extremely useful, for surely there could not be very many documents in the collection answering to this description. If these few documents (possibly just one) could be retrieved and assembled for the requester's inspection, he would presumably have no trouble in picking out the needed one from among them. Examples could also be given in which the nonstandard information might not be sufficient in and of itself, but would nevertheless become sufficient if it could be combined with whatever shreds of standard information are remembered.

The possibilities inherent in nonstandard information have never been seriously exploited in conventional libraries. There are good reasons for this. It seems to be the nature of nonstandard information to consist of a variety of "weak clues" rather than just one "strong clue." For example, the information that a book has a green cover is a "weak clue" in the sense that there may be thousands of books in the collection with green covers. It follows that the clue "green-covered"

would be by itself quite inadequate for retrieval, and it is only by combining a number of such weak clues that one might hope to narrow down the set of candidate documents to a helpful extent. Now, to construct and maintain a conventional file such as a card catalog for looking up combinations of weak clues would be a difficult task indeed. The file would have to be alphabetized for lookup first on one type of information, say color, and then within color on, say, size, within size on on something else, and so forth through all the various nonstandard clue types. But one file would not be enough; the requester who has forgotten the color of his book but remembers other nonstandard information would need a different file alphabetized first on some other clue type which he is able to remember. Continuing this line of thinking, it becomes apparent that one would need almost as many different files as there are permutations of clue types--a number large enough to raise doubts as to whether there would be any room left for books in the library after all the catalogs were installed. And as if this problem were not serious enough, we shall see later that any combination of several weak nonstandard clues reported from memory is likely to contain at least one clue that is in error, a circumstance which complicates the problem of catalog design immeasurably.

For these reasons it seems impractical to try to exploit nonstandard information by conventional means. However, it does not necessarily follow that it could not be exploited with the help of computers. It is unthinkable that a library user should have to scan all or even a substantial fraction of a complete holdings file to track down his document, but it is not unthinkable that a computer might do so. With an automated catalog or retrieval system, it may well be within the realm of practicality to perform searches for any arbitrary combination of remembered nonstandard clues. Moreover, the problem of partially mistaken information is not necessarily insurmountable if the use of computers is contemplated. Should the wanted document turn out not to be among the retrieved documents fulfilling his description, it must then be among some set of documents which almost matches his description, assuming that most of the data in his description is correct.

The nearly matching documents which are most likely to include the wanted document could be retrieved for the requester's inspection, then the next most likely, and so on until either the requester finds what he was looking for, or else the probability of doing so in a reasonable amount of time drops too low to justify continued searching. This plan would require the computer to make some sophisticated probability computations, it is true, but the retrieval process would not necessarily be significantly slowed down because of this. Numeric computation is just what computers are best at.

It is not our purpose here to describe exactly how a computer could be programmed to perform searches on the basis of possibly mistaken clues, except insofar as we shall have occasion in a later section to set forth for a special case the probability calculations which the computer would be required to make. The questions which should claim prior attention to all programming considerations are the following: Assuming that appropriate retrieval mechanisms were somehow made available for exploiting nonstandard clues to the maximum possible extent, how great an improvement in retrieval performance could one expect? Specifically, are there a significant number of potential library patrons who possess nonstandard information about the documents they need, and who would make use of whatever future facilities might be provided to exploit this information? And even more important, would these people tend to remember <u>enough</u> nonstandard information, and remember it <u>correctly</u> enough, to make the potential improvement in retrieval results worth pursuing. These questions will be the focus of attention in what follows.

## 2. The Need for Retrieval Facilities Exploiting Nonstandard Information

How great is the need for a means of allowing library patrons to use nonstandard information in their search for documents they want? Unfortunately it is impossible to gauge this need by questioning users in present-day libraries. The reason for this is that present-day libraries can do little or nothing to help a potential patron whose only information is of the nonstandard variety, and so such patrons, knowing this, stay at home. The best that can be done with current

user surveys is to make some rather oblique inferences about the probable number of potential library users who find themselves in the position of having nonstandard information but no way to exploit it.

In discussing questions of document retrieval it is helpful to distinguish between what is usually called subject retrieval and what we shall here call specific work retrieval. In the subject retrieval situation, the library user wishes to locate works on a topic or subject area of interest to him, but he does not necessarily have any prior familiarity with the works, nor for that matter even any advance assurance of their existence. The specific work retrieval situation is quite different in that the requester already knows of the existence of some particular document which he wants. Clearly, nonstandard information about the wanted document will enter the picture chiefly in connection with specific work retrieval, for the user will normally be able to specify detailed physical details only in connection with particular works with which he has had previous contact.

Since nonstandard information has potential value mainly for specific work retrieval, it is pertinent to ask whether specific work retrieval searches form a substantial part of all catalog searches made in present-day libraries. A number of catalog use studies provide evidence that they do. In E. Montague's recent survey of card catalog use studies [1], a summary is presented which includes fifteen studies that give clear statements of the proportion of catalog searches observed which were of the specific work type. The fifteen percentages for the proportion of specific work searches ranged from 41.8 per cent (for a public library system) up to 90 per cent (for a specialized library), the median figure being 60 per cent. Two investigators commented on a tendency for the proportion of specific work searches to be higher in libraries where the educational level of the population was high. The picture which emerges is that the preponderance of catalog usage today has as its purpose the locating of specific known works, and that this is especially true in libraries which serve a highly educated or highly specialized community of users. Of course, proposed improvements in specific work retrieval facilities such as those considered in this paper would well increase even further the proportion of specific

work searches made in future libraries, for the proportion of specific work searches versus subject searches reflects not only user needs but also the adequacy of the facilities made available for specific work retrieval and subject retrieval.

Another issue of interest is the number of potential searchers for a specific document who have actually had contact with the document itself. Those who have not are poor prospects as users of future facilities to exploit nonstandard information for searches based exclusively on a citation or bibliography are likely to be completed on the basis of author-title information alone, assuming they can be successfully completed it at all. A recent survey made by M. Blackburn [2] provides some idea of the proportion of specific work searches whose purpose was to locate documents actually read or at least seen by the searchers. In Blackburn's survey, 126 patrons of the University of Chicago library were stopped and questioned as they reached for a drawer of the main catalog. One hundred of these 126 turned out to be attempting to locate a specific work, confirming the previously mentioned findings to the effect that a majority of present-day catalog users seek known items. Of the 100 seeking a specific work, twenty-nine stated that they had previously seen or used the work they were looking for, and an additional thirteen who had never actually seen their document had nevertheless been given a verbal recommendation of it by someone who had. This makes a proportion of at least 29 per cent and possibly somewhat more of specific work searchers who would have been in a position to supply nonstandard information from their own personal memory or that of their colleagues. This finding is admittedly based on a small sample, and is not necessarily generalizable to other libraries with different user populations, but it serves to suggest at least that the number of searchers who possess nonstandard information is not insignificant. Moreover, the 29 per cent figure presumably understates to some unknown extent the number of <u>potential</u> patrons in a position to supply nonstandard information, for only those who could supply a sufficiency of standard information in addition to the nonstandard ever reached the library catalog to be interviewed.

The reader is referred to [2] for further details concerning the amount and types of nonstandard information which users of the University of Chicago library catalog tend to remember, as well as the accuracy of their recollections. It appears that a considerable amount and variety of nonstandard information, some of it accurate and some inaccurate, is in the users' memories. However, the ultimate significance of findings from user surveys for the design of future catalogs is unclear for the reason already mentioned, which is that what library patrons can remember at today's catalogs is not necessarily indicative of what the potential users of tomorrow's improved catalogs might be able to remember if future catalog facilities were designed to allow use to be made of nonstandard information.

3. The University of Chicago Memory Experiment

In view of the limitations of the user survey method, it was decided to conduct a special experiment to gain insight into what types of information tend to be remembered most often and most accurately about books commonly found on library shelves. In this "memory experiment," as we shall call it, human subjects were to be exposed to books and after a suitable lapse of time were to be questioned to determine what they could remember about the books. A memory experiment can, if properly designed, control to a large extent such problems as variability in the duration of the subjects' exposure to the books and also variability in their browsing or reading environment at the time of exposure. The experimental approach has its drawbacks as well, for one can never be certain that the length of exposure, experimental environment, motivation, time lapse between exposure and questioning, and other conditions of the experiment are truly representative of real-life conditions. Nevertheless the advantages of the experimental approach were felt to more than justify it as a complement to user survey techniques, and so the experiment was undertaken.

The experimental design is fully described elsewhere [3, 4]. However, the features of the experiment which are essential for present purposes are easily sketched. Briefly, a large number of subjects were allowed to select and read from books which interested them, but with

which they had had no prior acquaintance. Two weeks later, each subject was asked to fill out from memory a mimeographed questionnaire about each book from which he had read. The questionnaire attempted to determine which standard and nonstandard features of the perused books were remembered best. The subjects were not told the purpose of the experiment, so that what they remembered about the books was presumably fairly close to what they would naturally have remembered in a real-life browsing situation. The "library" from which they were allowed to make their selection consisted of a previously assembled collection of approximately 180 books in the subject area of psychology. No attempt was made to make this experimental collection a random sample of all existing books on psychology; instead, an attempt was made to cover a variety of topics in psychology which were thought to be of interest to the lay reader, as well as to include a wide range of nonstandard features. In all, 104 experimental subjects were tested on up to five books each, and a total of 440 usable questionnaires were obtained.

In addition to standard author-title-subject data, the questionnaire interrogated the subjects about the following nonstandard features of the books they had perused:

1. Color of cover (whether white, gray, orange, etc.)
2. Binding (spiral, cloth, etc.)
3. Approximate height (samples supplied)
4. Approximate number of pages
5. Condition (new, somewhat used, etc.)
6. Approximate date of publication
7. Type of work (handbook, textbook, etc.)
8. Level of work (popular, professional, etc.)

The questionnaire also inquired whether or not the book in question possessed the following features. These will later be referred to as "binary" features because only two answers (feature present and feature absent) are appropriate to such questions.

9. Index
10. Tables
11. Figures, charts, diagrams
12. Chapter titles
13. Quotations from literary works
14. Case studies
15. Graphs
16. Prefatory material
17. Footnotes
18. Bibliography or suggested readings
19. Dedication
20. Glossary
21. Problems at ends of chapters
22. Single volume (i.e., Is the book a single volume work?)
23. Translation (i.e., Is the book translated?)
24. Reprint or revision (i.e., Is the book a reprint or revised edition?)

This list of twenty-four features is thought to cover most, though not all, of the more obvious kinds of nonstandard information which come to mind as being of possible use. A few other kinds were touched upon in the questionnaire, but they will not be taken up here.

To give a clearer impression of the nature of the questionnaire, the full text of the question on cover color is quoted below as an example of a typical question format:

Color (Check the choice that most accurately describes the book.)

| | | |
|---|---|---|
| ____blue or blue green | ____black, dark gray, dark blue, etc. | ____green |
| ____brown or tan | | ____purple or violet |
| ____orange | ____red | ____yellow |
| ____gray | ____white | |

The ten color categories listed in this question were settled upon more or less arbitrarily by the experimenters. A sheet of special instructions was issued along with the questionnaire one of which informed the subjects that it was permissable to check two or more color categories if necessary to describe a multicolored book. Most of the questions followed a format similar to the above one, except that some--to be specific, the questions on size, date of publication, and number of pages--did not have the format of a multiple choice question but instead provided a single blank for an approximate figure. Note that no "don't know" blank was provided as part of the question on cover color. The absence of specially provided "don't know" blanks may have prompted some subjects to guess at many of the questions as best they could, a possibility whose implications will be discussed presently.

The pertinent data obtained from the memory experiment is tabulated in Appendix D. It consists of twenty-four tables numbered 1a through 24a, with one table corresponding to each nonstandard feature type listed above. Each table constitutes a cross classification of questionnaires by correct answer and by response actually given. Data from single blank questions such as the one asking the approximate date of publication were put into this matrix form by choosing a series of discrete ranges and interpreting the response as thought it had been a choice from among such ranges.

## 4. Preliminary Overview of Experimental Results

In examining the data compiled from the memory experiment, the two most obvious issues which come to mind are the following. First, what was the proportion of subjects who attempted an answer, as opposed to leaving the question blank? And secondly, of those attempting an answer, what percentage was correct? These two proportions can be readily determined for any nonstandard feature of interest using the tables in the appendix. The proportions of subjects attempting to answer ranged from a low of 29 per cent for the question on whether the book contained a dedication, up to 99 per cent for the question on the level of readership for which the work was intended. The median response

rate for all of twenty-four features was 74 per cent. The proportions of attempted answers (other than "don't know") which proved to be correct ranged from 24 per cent for the inquiry regarding the approximate number of pages up to 97 per cent for the question of whether the book was a single volume work, with a median accuracy rate for all features of 72 per cent. In order to obtain the accuracy rates some rather arbitrary decisions had to be made in some cases as to what constituted a "correct" response. For this and other reasons, it would be unwise to attach much significance to the exact figures just given. They are intended to convey a general impression only, to wit, that the response rate was on the whole rather high but that the accuracy rate among those who responded was for the most part unimpressive.

The high response rate and low accuracy rate observed for many of the questions suggests the possibility that the subjects may have been indulging in a good deal of guesswork. Because a "don't know" blank was not provided for all questions, and because there was no specific directive asking the subjects to indicate "don't know" responses by leaving questions blank, it is possible that there was a tendency for the subjects to make a stab at all questions which had a multiple choice format, whether they really knew the answer or not. Such a tendency would hardly be surprising in subjects who were students accustomed to multiple choice tests of the if-you-don't-know-make-a-guess type. There is no way of knowing just how strong the compulsion to guess was, although some evidence that it was not overwhelming is seen in the fact that almost all subjects left at least a few multiple choice format questions blank. The likeliest presumption is that the subjects did not do very much purely random guessing but that they nevertheless indulged in quite a bit of what might be called "semi-guesswork." That is to say, they probably attempted to give answers to many questions on the basis of exceedingly dim recollections or vague hunches.

If indeed a lot of semi-guesswork took place during the experiment, it was not necessarily a bad thing. In fact, it can be argued that a method of questioning which encouraged semi-guesswork was entirely appropriate for an experiment whose purpose was to gauge the usefulness

of nonstandard information for retrieval purposes. Briefly, the argument runs like this: When a retrieval system is unable to retrieve just one document for the patron with certainty that it is the one he wants, the next best thing it could do is, in effect, to determine for him an optimal order in which to search the collection. That is, it would be the task of the retrieval system to retrieve documents for the user's inspection in such an order that documents with the highest probability of being the wanted one would be presented to the user first. Even a vaguely recalled and possibly mistaken feature described by the patron, if exploited in the right way, could be used to improve this search order somewhat; for the feature in question presumably has at least a slightly greater probability of being as the patron describes it than it has of being any other way. Semi-guesswork should therefore actually be encouraged at future automated catalogs, and so it is appropriate that nothing was done to discourage semi-guesswork in the memory experiment. However, care is required that the data from the experiment be analyzed in such a way as to take the possibility of guesswork properly into account.

## 5. The Memorability of Nonstandard Information

The most obvious factor of importance affecting the potential usefulness of a given type of nonstandard information is its memorability. Unfortunately, the "memorability" of a feature is not an easy thing to define. The most obvious suggestions are quickly seen to be inadequate. For example, one might consider measuring the memorability of a feature by the percentage of questionnaires in which the question about that feature was answered correctly; but unfortunately this percentage fails to indicate whether the remaining questionnaires had wrong answers or no answers at all, a matter which is clearly significant in judging memorability.

The basic problem in using the experimental data to determine "memorability" is the unknown amount of guesswork and semi-guesswork which went on in the experiment. This means that any given correct answer may have been merely a lucky guess; it is certainly no proof in

and of itself that the subject really remembered anything. To meet this problem, it is essential that the data be analyzed in such a way as to evaluate the subjects' performance through comparison with what their performance would have been if they had adopted a strategy of guessing at all times. That is, we must ask: How much better did the subjects do by availing themselves of their recollections than they could have been expected to do through random guesswork alone?

For concreteness let us examine the figures found in Table 9a of Appendix D. A reasonable approach would be to compare these figures in some sensible way against what they might have been if the subjects had used a chance device to determine their answers. The first such device to come to mind is a fair coin. Are the figures in Table 9a consistent with the hypothesis that in all cases where a definite response was given, the subject had merely flipped a coin, answering that the book had an index if it came up heads and that it did not if it came up tails? Under the fair coin flipping hypothesis, one would expect the numbers of "index present" answers and "index absent" answers to be approximately equal, but the results show that the former outnumbered the latter by 212 to 87. Such a disproportion is extremely unlikely under the fair coin hypothesis and so that hypothesis must be rejected.

The assumption that the random device used was a fair coin was purely arbitrary, and an observation which suggests a more enlightening test. Could the subjects have been using a biased coin, one weighted in such a way that the expected ratio of heads to tails was 212 to 87? Testing the biased-coin hypothesis is equivalent to testing the hypothesis that the subjects were merely guessing, but doing so with a marked tendency to guess "index present" rather than "index absent," the odds being 212 to 87 in favor of the former. Such a tendency could easily appear without the memory of the book in question being its cause; for example, a tendency to guess "index present" could be occasioned by the general knowledge that most books have indexes. Hence the necessity to find out whether the obtained responses were correct more often than would be expected from such guesswork. Now if a coin biased to produce on the average 212 heads for every 87 tails had been used, one would

expect that for books with indexes the number of "index present" answers and "index absent" answers would be approximately the ratio of 212 to 87, and the same for books without indexes. On this basis, the cell entries to be expected under the biased coin hypothesis can be calculated. The calculated values are shown in parentheses in the upper four cells of Table 9a (2). The observed numbers in the table are not strikingly different from those in parentheses, indicating that as a group the responding subjects did only slightly better on this nonstandard feature by applying their memories than they could have been expected to do with an appropriate chance device.

TABLE 9a (2)

DATA FROM MEMORY EXPERIMENT CONCERNING INDEXES
AUGMENTED BY EXPECTED VALUES

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Index Present | Index Absent | |
| Index present . . . . . | 155 (145.3) | 57 (66.7) | 212 |
| Index absent . . . . . | 50 (59.7) | 37 (27.3) | 87 |
| No response . . . . . | 96 | 45 | 141 |
| Total . . . . . | 301 | 139 | 440 |

In cases where the difference between computed and observed results is small, it is customary to apply a statistical test to see whether the difference might reasonably be accounted for by chance factors alone. An appropriate test (the two-tailed Chi-square test at the .05 significance level with Yates correction for continuity) was applied to the above table, and it indicated that the differences between the observed and computed values could <u>not</u> reasonably be attributed wholly to chance factors. Stated more precisely, results as different from expectations as those observed would have less than one chance in twenty of occurring

under the biased coin hypothesis, and so the hypothesis may be rejected. This is statistical assurance that at least some of the subjects must have been using their memories rather than their guessing facilities on this question. The same test was made for the remaining six-cell tables in Appendix D with similar results in all cases but one. That case was the question on whether the book had problems at the ends of its chapters, the responses to which turned out not to be significantly more accurate than random guessing.

Comparing the four parenthesized figures in the above table with their unparenthesized counterparts gives some idea of the memorability of the index feature of books. However, it would be desirable to summarize the memorability of indexes in a single figure. As a step in this direction, it is possible to condense the six-cell table down to four cells by combining the "no response" row with the two upper rows. This is done as follows: One assumes that the 141 subjects giving no response had no recollection of the feature whatsoever. Therefore, if they had been forced to make a response, that response would have been a random guess. Suppose that a certain proportion p of the 141 had guessed "index present," and the remaining fraction (1-p) had guessed "index absent." The results would have been as shown in Table 9a (3). This table shows the quantities from the upper four cells of Table 9a (2) augmented by the expected numbers of additional guesses which would have accrued to these cells if the no response subjects had been forced to make wild guesses. In effect, collapsing Table 9a (2) into Table 9a (3) changes the rules of the experiment after the fact in such a way as to remove the complicating factor of null responses.

A single figure indicating memorability can be obtained from Table 9a (3) simply by subtracting the expected percentage of correct answers from the observed percentage of correct answers. The observed number of correct answers is 155 + 96p + 37 + 45 (1-p) and the number expected if all subjects had guessed is 145.3 + 96p + 27.3 + 45 (1-p). Converting to percentages and subtracting, one obtains a difference of 4.4 per cent. This figure, which represents the percentage of correct answers over and above the percentage to be expected from guesswork, we

shall call the "memorability level" of the feature. It is possible to compute the memorability level in a similar way for all the nonstandard features under consideration, including those whose tables in the appendix consist of more than six cells.

TABLE 9a (3)

DATA FROM MEMORY EXPERIMENT COLLAPSED INTO FOUR CELLS AND AUGMENTED BY EXPECTED VALUES

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Index Present | Index Absent | |
| Index present . | 155 + 96p<br>(145.3 + 96p) | 57 + 45p<br>(66.7 + 45p) | 212 + 141p |
| Index absent . | 50 + 96 (1-p)<br>[59.7 + 96 (1-p)] | 37 + 45 (1-p)<br>[(27.3 + 45 (1-p)] | 87 + 141 (1-p) |
| Total . . | 301 | 139 | 440 |

In Table 1, the twenty-four nonstandard features are ranked according to their memorability indexes. From the table, it is seen that the approximate number of pages was the most memorable feature of a book to the subjects of this experiment. The color of the cover, which one might have supposed would be among the most memorable features, ranks only ninth. The least memorable aspect of a work among all those investigated was whether it had problems at the ends of its chapters, which is not surprising in view of the previously mentioned finding that the observed responses did not even show a statistically significant difference from random responses for this feature.

The average feature showed an improvement of only 9 per cent in number of correct answers over what would be expected from sheer guesswork, and the most memorable feature an improvement of only 19 per cent. This is hardly an impressive showing. However, in fairness to the mental abilities of the subjects, it must be added that not all mistaken responses were necessarily occasioned by faulty memory. Some of what were recorded

TABLE 1

NONSTANDARD FEATURES RANKED IN ORDER OF DECREASING MEMORABILITY

| Nonstandard Feature | Number of Response Categories | Memorability Level |
|---|---|---|
| Number of pages . . . . . | 6 | 19% |
| Case studies . . . . . | 2 | 18 |
| Level of work . . . . . | 6 | 17 |
| Figures . . . . . | 2 | 16 |
| Date . . . . . | 10 | 15 |
| Type of work . . . . . | 13 | 15 |
| Tables . . . . . | 2 | 13 |
| Height . . . . . | 7 | 12 |
| Color of cover . . . . . | 11 | 11 |
| Quotations from literary works . . . . . | 2 | 10 |
| Binding . . . . . | 8 | 9 |
| Condition . . . . . | 5 | 9 |
| Footnotes . . . . . | 2 | 8 |
| Graphs . . . . . | 2 | 7 |
| Translation . . . . . | 2 | 7 |
| Reprint or revision . . . . . | 2 | 5 |
| Index . . . . . | 2 | 4 |
| Bibliography . . . . . | 2 | 4 |
| Dedication . . . . . | 2 | 4 |
| Single volume . . . . . | 2 | 3 |
| Chapter titles . . . . . | 2 | 3 |
| Preface . . . . . | 2 | 2 |
| Glossary . . . . . | 2 | 1 |
| Problems at ends of chapters . . . . . | 2 | 0.4 |
| Average . . . . . | 4 | 9% |

as mistakes may have been a matter of mere semantics--of terminological differences between experimenters and subjects. As a case in point, there was a strong tendency for subjects to classify as "black, dark gray, dark blue, etc." books which the experimenters had judged to be "blue or blue-green." The experimenters themselves commented on the difficulty of deciding in which of these two classes to put certain moderately dark blue books, so it would hardly be surprising if there had been some differences of judgment on this point between experimenters and subjects. There are indications that where type of work and condition of work were concerned, rather wide differences in judgment arose between the experimenters, who were accustomed to the terminology of librarianship, and the subjects, who were not. The extent to which such differences of judgment contributed to the total number of ostensibly "incorrect" answers obtained in the experiment is not known. Whatever the extent, however, any semantic difficulties affecting the experiment could well affect the success of future retrieval systems also, and so for present purposes they can be viewed as influences tending to make the experiment more realistic.

The measure of memorability level employed in Table 1 has many good aspects. For example, because it involves a comparison with random guessing, it is not greatly affected by the arbitrary decision as to how close a subject's recollection of the number of pages in a book must be to the actual number of pages in order that his estimate be considered "correct." On the other hand, it is necessary to bear in mind that this measure of memorability has limitations. Its most serious defect is that it has a tendency to favor features with many response categories over those with few; at least, this is so under certain plausible interpretations of the word "memorable." In consequence, it is not clear that, for example, a book's color is really more memorable than its footnotes, for the better showing of the former in terms of the memorability level may be due mainly to the color question's larger number of allowable responses on the questionnaire (eleven as opposed to two). However, features with the same or nearly the same number of answer categories can be compared with reasonably safety. The number of answer

categories for each feature is included in Table 1 to aid in its interpretation. Another limitation of the measure is that it makes no allowance for degrees of mistakenness. For example, an estimate of a book's length which is in error by only 100 pages is treated as if it were just as mistaken as an estimate which is out by 500.

Conceivably some more elaborate measure of memorability could be constructed to overcome the dependence of the "memorability level" measure on the number of response categories. However, there is some question whether one could ever discover a completely convincing mathematical formulation for such a vague concept as "memorability." In any case, it would seem that efforts to construct a more refined measure would be better directed toward explicating the concept of "retrieval usefulness" instead of "memorability." It is the utility of a book property for retrieval purposes which is of ultimate interest and it will shortly be seen that memorability is only one factor affecting retrieval usefulness.

## 6. Expected Search Length as a Measure of Retrieval Usefulness

How can "retrieval usefulness" be gauged? The measure which will be employed here is based on the concept of expected search length and its companion notion, the reduction factor in expected search length. These concepts are presented in detail elsewhere [5] in the more general setting of subject retrieval. The basic notions are equally applicable to specific work retrieval however, and in this context they are simple enough to be conveyed by a few examples.

By the "expected search length" of a request is meant the number of unwanted documents which the requester could expect to have to search through randomly before finding the wanted one. For example, if the wanted document is known to be in a set of 201 documents, the user could examine the documents in the set one at a time in random order until he comes upon and recognizes the one he is after. If he does this, the wanted document might turn up early in his search and it might turn up late, but the statistical expectation is that this user

will have to look through exactly 100 unwanted documents (i.e., half of the unwanted documents in the set) before coming to the wanted one. A nontechnical interpretation of this statistical expectation is that if he were to repeat his random search for many hypothetical trials, the average number of unwanted documents he would be forced to discard in each trial would be approximately 100.

This simple idea contains the germ of a method for the evaluation of nonstandard clues. For the sake of a clear example, let us make some simplifying assumptions. First, let us assume that we wish to evaluate a nonstandard clue type's potential not in combination with other nonstandard information, as it would almost certainly be used in practice, but instead in complete isolation. That is, we imagine a hypothetical library in which a certain type of nonstandard clue is the only type of clue, standard or nonstandard, which a requester is allowed to submit. The question of interest is how much the library's retrieval system would be able to do for the requester with this one clue. Secondly, let us assume for simplicity that the clue type in question is of the binary sort. Thirdly, let us put aside for the moment the problem of poor memory and assume that every requester in this library can be counted on to remember, and remember accurately, whether or not the book he wants has this binary property. Finally, let us make up some statistics about this hypothetical library: (1) The size of the collection is only 201 documents; (2) 61 of the documents have the property and the remaining 140 do not; (3) when users submit requests to this library, 40 per cent of the time it is a document having the property which is wanted and 60 per cent of the time it is not.

Obviously no retrieval system could isolate the wanted book on the basis of this single binary clue, but it could isolate the set of all books which answer to the clue, and this will decrease the requester's expected search length. Suppose a requester submits a request consisting of the answer "feature present" to the question of whether the book he wants has the property. The set of 61 documents having the property could be retrieved for his inspection on the basis of this clue. One of the 61 is the book he wants, so if he searches this retrieved set randomly,

his expected search length will be one-half of 60 or 30 unwanted documents. Similarly, the expected search length for a "feature absent" request is half of 139 or 69.5 unwanted documents. With 40 per cent of the incoming requests resulting in an expected search length of 30 and 60 per cent in 69.5, the average expected search length will be .4(30) + .6(69.5) = 53.7. This means that the number of unwanted documents which would have to be searched through should average approximately 54 per request in the long run in this library.

The figure of 54 can be put in perspective by comparing it with what the average expected search length would have been if not even the single binary clue had been utilized. As previously calculated, a totally random search would have an expected search length of 100. Exploiting the clue reduced this by 100 - 54 = 46; that is, the expected search length was reduced by a factor of 46 per cent as against what it would have been if the retrieval process had made no use of the clue. The figure of 46 per cent we call the expected search length reduction factor associated with the binary property. It can be interpreted to mean that using the binary property as a clue for retrieval would save the average user 46 per cent of the search effort he would otherwise have had to expend to search out his book randomly. Speaking more generally, it can be viewed as a measure of the potential utility of the nonstandard feature in question.

Some of the simplifying assumptions made for the sake of the above example are inessential. The calculation of the expected search length reduction factor for nonbinary features is a direct extension of the binary case. The assumption of a definite collection size is not really needed, since the reduction factor is virtually independent of collection size except for very small collections. Hence statistic (1) could have been dispensed with and (2) restated in terms of percentages. In section 8, it will be shown how the possibility of mistaken information can also be taken into account.

## 7. The Role of Collection Statistics

Although the exact relationship may not be immediately apparent, it seems clear that the relative abundance or paucity of books having a certain property must have something to do with how useful that property would be as a retrieval clue. To take a colorful example, there is reputed to be a rare edition of a book on reptiles, the binding of which contains a rattlesnake's rattle which is activated whenever the book is opened. Now the property of containing such a rattle is presumably a highly memorable property. However, it is such a rare property that it would hardly be worthwhile to ask the average library patron whether his book rattles when opened, because the chances are so remote that it does. Evidently then the memorableness of the property is not the only consideration; the "collection statistics" also affect utility.

The example in the last section showed that the collection statistics which enter the question are of two distinct types. One is what could be called holdings statistics, and pertains to how the documents on the library shelves are distributed among the possible categories of a feature. The other type may be called usage statistics and pertains to the distribution of a feature's categories observed among incoming specific work requests. To give insight into how collection statistics affect retrieval utility, let us once again consider the hypothetical example of a binary feature which is always remembered accurately. Assuming for the moment that there is no noticeable difference between the holdings and usage statistics for a given property, it is possible to compute the expected search length reduction factor for any statistics of interest by the method of the last section. For example, if 30 per cent of the documents held in a collection have the property and likewise for documents requested, the expected search length reduction factor turns out to be .42. (Actually the figure is only approximately .42, although it will approximate it more and more closely as larger and larger collection sizes are assumed.) By generalizing this calculation, the reduction factor associated with any given proportion x as the assumed collection statistic can be shown to be $2x(1-x)$.

The relationships expressed by this formula is displayed graphically in Figure 1. Observe that the utility of a binary feature as measured by the expected search length reduction ratio vanishes as x approaches 0 or 1. This confirms what was previously brought out on intuitive grounds alone, namely that a rare property is of negligible usefulness no matter how memorable. Observe also that the feature is of maximum utility if x = .5--that is, if the property "divides" the collection evenly. Finally, it is of interest that the reduction ratio is not overly sensitive to the collection statistics so long as x is in the general vicinity of .5. Indeed, the proportion can vary between .3 and .7 without causing the reduction factor to leave the narrow range between .42 and .5. Although it will not be demonstrated here, the same sort of general observations can be extended to nonbinary properties and properties which are not totally memorable.

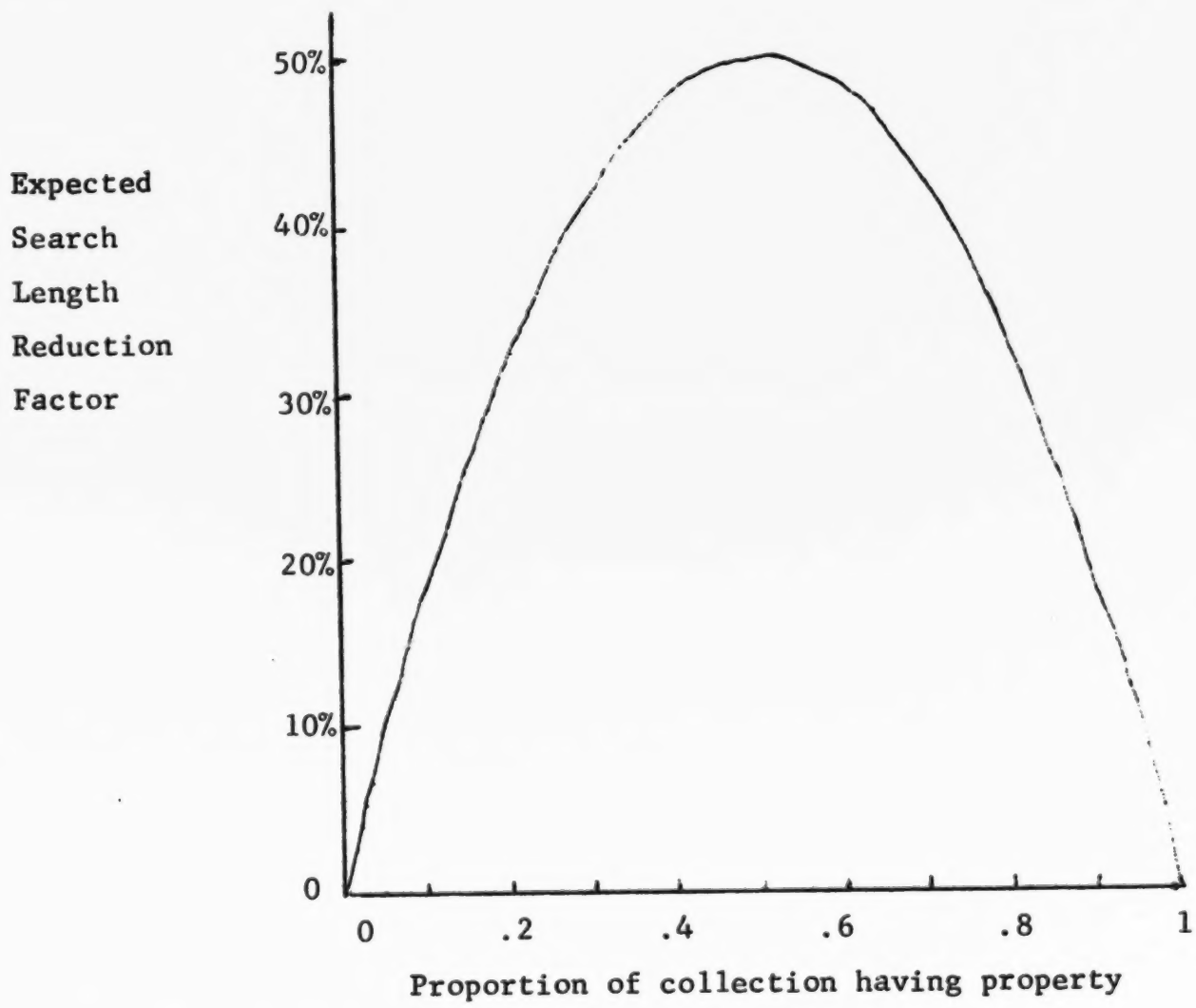



Figure 1. Expected search length reduction factor as a function of the proportion of the collection having a binary property of interest. Perfect memorability is assumed.

The dependence of potential usefulness on collection statistics raises a problem. It is impossible to gauge a feature's potential usefulness for retrieval, either absolutely or relative to that of other features, without making assumptions about the collection for which its use in retrieval is contemplated. What assumptions should be made? No library collection is exactly like any other, so if the nonstandard features are evaluated relative to one particular library, the evaluations obtained will not be entirely valid for any other library. The best that can be done here is to make the evaluations with respect to some more or less typical library collection, so that at least a gross impression can be gained of what their value would be in other collections. Then, if a reader has special need of a more precise evaluation relative to some other collection, it should be possible for him to repeat our calculations using the statistics of that particular collection.

The collection statistics which we shall adopt here are estimates obtained from two random samples of the collection of the main library at the University of Chicago. The first sample, which provided the holdings statistics, consisted of 125 documents drawn with the help of random number tables from the main holdings list. The second, which yielded usage statistics consisted of 106 documents drawn randomly from those returned to the circulation desk by the library patrons. These seemingly small samples were in fact sufficiently large so that all estimates of proportions could be made with .95 confidence intervals whose widths ranged between ±3 per cent and ±9 per cent. This was felt to be sufficient accuracy in view of the fact that the expected search length measure of utility for which the data is required is less sensitive to collection statistics than to statistics pertaining to memorability. There is also an argument against the need for large samples arising from circumstance just discussed, namely, that the statistics of other library collections are not necessarily identical with those of the University of Chicago library anyway.

The raw data obtained from the samples is tabulated in Tables 1b through 24b of Appendix D. As one would expect, some features showed collection statistics which were much more favorable for retrieval purposes

than others. Among the binary features, the following seven were distributed in the library holdings in the most favorable way: index, bibliography, footnotes, tables, figures, preface, and quotes; each of these occupied a proportion of the library between .3 and .7. Three features--glossary, problems, and single-volume works--showed extremely unfavorable distributions, lying outside the range .04 to .96. There were no truly striking differences found between the holdings statistics and the corresponding usage statistics, although for some features there was a difference large enough to be statistically significant (at the .05 significance using the Chi-square test) in spite of the smallish sample sizes. These included the type of work, level of work, type of binding, condition, chapter titles, index, and presence of literary quotations.

## 8. Expected Search Length for a Possibly Mistaken Request Clue

The hypothetical one-clue-library method of evaluation illustrated in Section 6 is easily extended to apply to nonbinary features. We shall show next how it can be generalized to apply as well to information which may be mistaken. Consider a patron who submits to the retrieval system the information that the book he wants is red. Because his memory may be faulty, there is no subset of the collection which can be said with certainty to contain the book he is really after. By the same token, no book or set of books can be eliminated from consideration entirely. The most that can be said is that the books in a certain set--probably but not necessarily the set of all red books--have a higher probability of being what is wanted than do any of the remaining books. Thus all inferences drawn from the patron's stated clue must be probabilistic in nature; they must be inferences to the effect that certain books are <u>more likely</u> to be the one wanted than are others.

Suppose now that a retrieval system uses an appropriately programmed computer or is in some other way able actually to compute for each book in the collection the probability that it is in reality the wanted one, given that the requester believes his book to be red. The highest probability figure will be assigned to the members of a certain color class, presumably the class of red books. The next highest

probability will be assigned to members of some other class--the orange books, perhaps, if a strong tendency has been observed among requesters to confuse red and orange in their memories. The third highest probability will go to each member of still another class, and so on until each of the eleven color classes has been assigned a number which is the probability that any given member book is the required one. The obvious retrieval strategy is the following: retrieve for the requester's examination the books with highest probability first. If he fails to find his book by searching randomly through these but is willing to search further, retrieve next the books with second highest probability, and so on.

The assumption involved here is essentially that the retrieval system is able to respond to a requester's nonstandard clue by ranking all documents in the collection according to their probability of being wanted. This assumption will allow a calculation of the potential utility of that clue expressed in terms of an expected search length reduction factor. The calculation will show the maximum utility of the clue which would be realizable in isolation from other clues, for it seems clear that to rank the documents by probability is the best that could be done for the requester on the basis of a possibly mistaken clue. The remainder of this section presents the details of how the probabilities can be calculated from the data in Appendix D, and how the expected search length reduction factor can in turn be computed from the probabilities. Readers willing to accept the mathematics on faith may wish to proceed directly to Section 9.

The first task is to deduce, for any given search request having the form of an isolated nonstandard book property, that ranking of the collection by probability which an ideal retrieval system would present to the requester as a response to his request. For the sake of concreteness, let us continue to speak in terms of a color clue. Let the symbol "Black" denote the event that the request consists of the clue that the book has a black or very dark cover. That is, "Black" names the event that the library patron thinks the book he wants is black, and that he has so stated, say by checking the appropriate blank on the

request card. Similarly, let "Blue" denote the event that he thinks his book to be blue, and so forth through the eleven color categories. The symbol "No response" can be added to denote the event that the requester does not remember the color at all and so leaves the request form blank. Further, let "BLACK" denote the event that the book which our requester wants is <u>really</u> black, let "BLUE" denote that it is actually blue, and so forth for the remaining color categories. As a preliminary step toward deducing the wanted ranking, we calculate conditional probabilities of the form typified by pr (BLUE/Black), which is the probability that our patron is really after a blue book, given that he says the book he wants is black.

The calculation proceeds using Bayes' theorem

$$\text{pr(BLUE/Black)} = \frac{\text{pr(Black/BLUE) pr (BLUE)}}{\text{pr(Black/BLUE)pr(BLUE)} + \ldots + \text{pr (Black/BLACK)pr(BLACK)}}$$

The right side of the identity involves conditional probabilities such as pr(Black/BLUE). By Table 1a of the appendix, there are ninety cases in which subjects were questioned about books which were really blue, and in twenty out of these ninety the subjects mistakenly remembered their book as being black, so the experiment indicated that pr(Black/BLUE) is approximately 20/90. A slightly better estimate of the true probability is obtained by adding one to the numerator and the number of possible responses (including no response) to the denominator, yielding (20+1)/(90 + 12) = .206 as the desired probability. (This correction is a generalization of the formula of Laplace [6, pp. 133-135]. Although controversial, it is nevertheless preferable to the uncorrected ratio which would lead to such absurd estimates as a probability of zero for small samples where the numerator happens to be zero.) The remaining eleven conditional probabilities on the right side are calculated similarly. The right side involves also quantities such as pr(BLUE), the probability prior to receiving his request that the patron's desired book is blue. According to Table 1b of the appendix, twenty-eight of the random sample of 106 books withdrawn from the University of Chicago library were blue. Making a Laplacian correction as before, we take (28+1)/(106+11) = .248 as the estimate of the proportion of users who

desire blue books. The other ten colors are treated analogously. Upon substituting all these estimates into the Bayesian equation, one obtains the estimate pr(BLUE/Black) = .330. This figure can be interpreted as meaning that when a library patron states that the book he wishes to locate is black, the chances are about one in three that it is really blue. Such an interpretation assumes of course that the patron is encouraged to use guesswork to the same extent as were the experimental subjects, and also that the semantic difficulties associated with the color category labels are as they were in the experiment. The remaining ten conditional probabilities pr(RED/Black), pr(BLACK/Black), etc., are calculated in a similar way.

It may be asked why a probability such as pr(BLUE/Black) cannot be obtained directly from Table 1a of the appendix, instead of indirectly via Bayes' identity. The reason is that the book collection used in the memory experiment was not a random sample of any real library collection, and the estimate of pr(BLUE/Black) so obtained would be contaminated by any accidental bias toward or away from blue books in experimental collections. In contrast, the conditional probability pr(Black/BLUE) can be safely obtained from Table 1a and is not affected by any such bias the experimental collection might have had. It might also be asked whether the use of Bayes' theorem is not objectionable. In spite of the controversy surrounding Bayes' theorem and the notorious misapplications of it which have been perpetrated in the past, its application in the present situation is felt to be legitimate, especially since the prior probabilities used are not mysterious assumptions but empirically obtained estimates.

With the foregoing calculations completed, the assignment of probabilities to individual documents is easy. We wish to assign to each document in the entire collection its probability of being the one truly wanted. Suppose the collection contains a total of N documents. Then the number of, say, blue documents it can be assumed to contain is obtained from the holdings sample findings of Table 1b in the appendix. According to the table, 26 of the 125 books sampled were blue, which leads to the assumption that the number of blue books in the hypothetical library equals the proportion (26 + 1)/(125 + 11) times N, or .199 N.

We have already determined that when a user thinks his book is black, the probability of its really being blue is .330. In the absence of information to the contrary, each blue book can be considered equally likely to be the one in question. It follows that each blue book has probability .330/.199N = 1.66/N of being the wanted book. Treating all eleven colors in this way, one can determine the ideal ranking in response to the request "Black." It has eleven ranks or "levels" in the following order:

| | | |
|---|---|---|
| .081 N | black books each having probability | 2.22/N |
| .199 N | blue books each having probability | 1.66/N |
| .029 N | gray books each having probability | 1.60/N |
| .103 N | brown books each having probability | .95/N |
| .007 N | purple books each having probability | .79/N |
| .015 N | yellow books each having probability | .78/N |
| .015 N | orange books each having probability | .66/N |
| .154 N | multicolored books each having probability | .65/N |
| .007 N | white books each having probability | .63/N |
| .118 N | green books each having probability | .60/N |
| .272 N | red books each having probability | .52/N |

This list describes the best possible ranking with which a retrieval system could respond to the isolated request clue "Black." To illustrate the meaning of the list, in a 1,000 document collection constituted like the University of Chicago library, there would be about eighty-one black books, and these, having a relatively high probability of about .002 each, should be retrieved first. If the patron does not find his book among these but still wishes to continue his search, the 199 blue books should be presented next; and so forth. The rankings which would be required by some other clue that a requester might give, such as his statement that his book is blue, or even his statement that he does not remember its color, can be constructed in a completely analogous fashion.

Let us turn now to the problem of evaluating the average usefulness of these rankings. A formula for the expected search length of a request in any arbitrary collection ranking is derived in [5]. When

specialized to the case of specific work retrieval, it becomes

$$esl(q) = j + \frac{1}{2}$$

where q is the query or search request in question, j is the total number of documents in all levels of the ranking which precede the level containing the wanted document, and i is the number of unwanted documents in the level containing the wanted document. This formula merely states that a requester determined to find his book would have to search through all the books in all the levels preceding the level in which he will eventually find his wanted book, plus an expected total of half the unwanted books in that level. For example, the expected search length for a user who submits the request clue "Black" when the book he wants is really blue would be

$$esl_{BLUE}\ (Black) = .081\ N + \frac{.199N - 1}{2}\ .$$

If N is assumed to be large this expression can be simplified by deleting the minus one.

The special case where the wanted book is really blue is of no particular interest in itself, but the value of $esl_{BLUE}$ (Black) can be combined with similarly computed values for $esl_{BLACK}$ (Black), $esl_{GRAY}$ (Black), etc., using the formula:

$$esl(Black) = pr(BLUE/Black)\ esl_{BLUE}\ (Black) + \ldots + pr(BLACK/Black)\ esl_{BLACK}\ (Black).$$

This formula weights each special case's expected search length by the probability that that special case will arise from the request "Black." The resulting value is an expected search length free of special assumptions about where the wanted document really is in the weak ordering. Substituting previously obtained figures for the probabilities one obtains esl(Black) = .353N. To illustrate the meaning of this figure, in a library of 1,000 documents, a user submitting the lone clue "Black" could expect to have to search through 353 documents, on the average, before finding the wanted one.

Even the value of esl(Black) is of little interest in and of itself, since "Black" is merely one of twelve possible responses to interrogation about color. What will the expected search length be <u>on the average</u> after a patron has been asked the color of the book he desires? This average can be obtained by weighting the expected search lengths for particular colors by the probabilities of those colors being given as clues. In symbols,

$$\overline{esl} = pr\ (Black)\ esl(Black) + \ldots + pr(Blue)\ esl(Blue) + pr\ (No\ response)\ esl(No\ response)$$

where $\overline{esl}$ denotes the expected search length averaged over all users of the system. The probabilities in the right side can be expanded using identities of the form

$$pr(Black) = pr(Black/BLUE)pr(BLUE) + \ldots + pr(Black/BLACK)pr(BLACK).$$

The conditional probabilities in this latter expression have already been estimated from Table 1a of the appendix, and its remaining probabilities we have already estimated as usage statistics from Table 1b of the appendix. Substitution of these values yields the estimate pr(Black) = .155, and the other probabilities are similarly obtainable. With all the necessary ingredients now available, $\overline{esl}$ can be computed and turns out to be .353N.

We conclude that by exploiting nonstandard cover color information it would be possible to attain an expected search length of around .353N documents for the average user of a library of N books. An average expected search length of .5N is achievable by totally random searching. The expected search length reduction factor is therefore (.5N - .353N)/.5N, or .294. In other words, the use of a patron's color memory could be expected to cut down the length of his search by about 29 per cent on the average. This percentage can of course be computed for any of the nonstandard features, not just cover color, and provides a convenient basis for comparing the retrieval utility to be expected from one type of feature with that of others.

## 9. The Relative Usefulness of the Various Clue Types in Isolation

The first two columns of Table 2 constitute a list of all twenty-four clue types together with their corresponding expected search length reduction factors in descending order of the latter. As previously explained, a reduction factor represents the percentage by which a library user's search effort for his book would (on the average) be cut down if he could be given an opportunity to state his recollection of the feature in question as an input request to an appropriate retrieval system. It is seen from the table that a properly utilized nonstandard clue could be expected to reduce the length of a patron's search by as much as 57 per cent or as little as 3 per cent, depending on the clue type. The reduction factors of the various clue types are spread fairly evenly between these extremes, and average 21 per cent.

The first observation to be made about Table 2 is that none of the reduction factors are impressively large. One might have hoped, for example, that by exploiting a library patron's knowledge of a book's color it would be possible to reduce the amount of searching he would have to do to find the book by 80 or 90 per cent--that is, by a factor of five or ten. Instead, the experimental results indicate that not even a factor of two would be achieved. This makes it clearer than ever that no single clue type would be of much use in isolation. A second and related observation is that there are some clue types, such as the presence in a book of a dedication, a glossary, or problem sets, which show so little promise of retrieval usefulness that it is questionable whether it would be worthwhile to make use of them at all. Thirdly, there is a tendency in Table 2 as there was in Table 1 for clue types with many answer categories to appear near the top of the ranking, while those with few or only two answer categories appear lower down. Apart from this, it is difficult to discern any very striking pattern in the ranking. There is, for example, no noticeable tendency for the "intellectual" attributes of a book such as its level and type to rank either much higher or much lower than "physical" attributes with a similar number of answer categories.

TABLE 2

NONSTANDARD FEATURES RANKED IN ORDER OF DECREASING POTENTIAL USEFULNESS

| 1. Nonstandard Feature | 2. Expected Search Length Reduction Factor | 3. Number of Response Categories | 4. Expected Search Length Reduction Factor Per Stored Bit (Col. 2 ÷ $\log_2$ Col. 3) |
|---|---|---|---|
| Date . . . . . | 57% | 10 | 17% |
| Type of work . . . . . | 49 | 13 | 13 |
| Number of pages . . . | 43 | 6 | 17 |
| Binding . . . . . | 32 | 8 | 11 |
| Color . . . . . | 29 | 11 | 9 |
| Level . . . . . | 27 | 6 | 11 |
| Height . . . . . | 27 | 7 | 9 |
| Quotes . . . . . | 26 | 2 | 26 |
| Condition . . . . . | 26 | 5 | 11 |
| Index . . . . . | 23 | 2 | 23 |
| Figures . . . . . | 21 | 2 | 21 |
| Tables . . . . . | 21 | 2 | 21 |
| Chapter titles . . . . | 20 | 2 | 20 |
| Graphs . . . . . | 18 | 2 | 18 |
| Footnotes . . . . . | 18 | 2 | 18 |
| Case studies . . . . . | 16 | 2 | 16 |
| Translation . . . . . | 15 | 2 | 15 |
| Preface . . . . . | 14 | 2 | 14 |
| Bibliography . . . . . | 8 | 2 | 8 |
| Single volume . . . . | 7 | 2 | 7 |
| Reprint or revision . | 7 | 2 | 7 |
| Dedication . . . . . | 5 | 2 | 5 |
| Glossary . . . . . | 3 | 2 | 3 |
| Problems . . . . . | 3 | 2 | 3 |
| Average . . . . . | 21.4% | 4.0 | 13.5% |

The tendency for features with many response categories to appear high in the list has a straightforward explanation. When a patron is questioned about a many-category feature such as color, his reply contains more information (in the information-theoretic sense) than would his answer to a question about, say, a binary feature, such as the inclusion of an index. This is true because a multiple choice question offering many choices is by nature capable of eliciting more information than one offering only two choices. The same point can be made in terms of partitions of the document collection: A binary feature can only divide the collection into two subsets, whereas nonbinary features can partition it further and so permit a better focusing of the requester's search efforts. The ranking in Table 2 is "unfair" insofar as it fails to correct for the natural advantage enjoyed by the features with many response categories.

These admittedly vague remarks can be made more concrete by considering the amount of computer storage space which would be taken up by the various types of document descriptions. A binary feature would require only a single binary digit of storage per document, with, say, a "1" to signify the presence of the feature in the document and a "0" to indicate its absence. A four-category feature would require two bits, an eight-category property three, and so on, with each n-category feature requiring approximately $\mathrm{Log}_2 n$ bits of storage space. In an automated catalog where computer storage space was a crucial consideration, the utility of a feature would have to be considered in relation to its price, namely, the storage space needed to record it. In such circumstances the critical quantity to be examined would be the expected search length reduction factor <u>per stored bit</u>, obtained by dividing the reduction factor for a feature by the logarithm with base two of the number of categories subsumed by the feature. The storage problem is a real one, but even aside from any practical storage considerations, this quantity probably achieves as good a correction for the above mentioned "unfairness" as could be hoped for. In column 4 of Table 2, the expected search length reduction factors are given on a per-stored-bit basis. Column 4 should be consulted in lieu of column 2 if it is desired to

gauge potential usefulness relative to a given amount of stored catalog information rather than to a given number of questions to be answered by the library user.

## 10. The Usefulness of Nonstandard Clues in Combination

The assumption in force up until now that only a single nonstandard clue would be used to effect retrieval was a highly artificial one. It was imposed only in order to obtain separate usefulness ratings for the different clue types. In actual practice, a large number of clues would have to be solicited from the library patron and used in combination in order for him to derive any substantial benefit from their use.

Let us review in more detail how nonstandard clues could be used in combination. Suppose a library patron cannot remember enough standard information about a book to be able to locate it using conventional library resources, but can nevertheless remember some nonstandard information about it. In a future library equipped to cope with his problem, he might well be asked to fill out a search request card consisting of multiple-choice questions much like the twenty-four questions with which we have been concerned in this study. His completed request card would be submitted as input to a computer programmed especially to compute, for any combination of nonstandard properties, the probability that a book having that combination of properties is the book wanted by the requester. The computations would be based on statistics pertaining to the memorability of the properties--statistics obtainable either from memory experiments such as the one reported here or from the recorded past experience of the system--and also on collection statistics. The results of the computations would be that books having such and such a combination of properties are the likeliest candidates, books with some other combination are next likeliest, and so on. The file of library holdings would then be searched automatically for documents belonging in the high-likelihood classes. The final output given to the user would be a bibliographic list of documents (or possibly the physical documents themselves) grouped in such a way that he can

conveniently scan the documents with the highest likelihoods first. If the computed probabilities are very low even for documents in the highest likelihood group (this would be the case, if, for example, the user had left most of the questions on the request card blank), he might wish to abandon his search at the start. Otherwise, he would scan the list until he had recognized the book he is after, although he might at any time give up either from lack of patience or lack of further documents having a sufficiently high probability to justify continued searching. No doubt there are many possible variations on this outlined procedure for exploiting nonstandard clues, but the essential element in all of them must be some means of obtaining for the user's inspection at least the first few levels of a ranking by probability of the document collection.

The computations necessary to associate probabilities with property combinations are fairly involved. The complicating factor is that the nonstandard features of interest are in general not distributed in the document collection in such a way as to be statistically independent of one another. There is also no assurance of statistical independence between what a library user tends to remember concerning one type of feature and what he tends to remember about another. The generalization of the probability calculations of Section 8 in such a way as to take proper account of the troublesome dependencies, though not impossible, will not be carried out here. Instead, we shall merely present an extremely rough indication of how effective a retrieval system which could compute the proper probability rankings would be.

One can readily obtain a crude estimate of the effectiveness of a given combination of clue types simply by ignoring the problem of statistical dependencies. To illustrate this, consider the case of a retrieval system which will accept both date and type of work clues. By Table 2, the use of information as to approximate date will (roughly speaking) cut down by 57 per cent the number of books to be searched, leaving 43 per cent. The type-of-work information will cut this down by a further 49 per cent leaving only 43 per cent - .49 (43 per cent) = 21 per cent of the original body of documents. The reduction factor for

the combination of these two leading clue types is therefore 100 per cent - 21 per cent = 79 per cent. A first approximation to the reduction factor for any clue-type combination of interest may be obtained in the same way.

Using this crude method of estimation, one finds that the expected search length reduction factor achievable from the simultaneous use of all twenty-four clue types investigated is approximately 99.8 per cent. This estimate is on the high side; it would probably have to be lowered substantially if the statistical dependencies were taken into account. On the other hand, if refinements were made in the use of the twenty-four clue types, and if in addition other clue types were utilized which are not among the twenty-four, the additional retrieval power so achieved would help to make up for this to some unknown extent. It is therefore not unreasonable to take the 99.8 per cent figure as it stands as about the best order-of-magnitude guess as to the combined potential retrieval usefulness of "all" nonstandard types of information which can be made at this time. To the extent that the conditions of the memory experiment can be assumed to reflect future retrieval conditions, and to the extent that the statistics of the University of Chicago library are typical of document collections in general, it can be said that optimal utilization of all nonstandard information possessed by a library patron about a document with which he has had previous contact would result in reducing by a ratio of something like 500 to one the expected search effort necessary for him to locate the document in a large collection.

Some tentative conclusions can now be drawn. An expected search length reduction factor of around 99.8 per cent would be very useful in a small library of, say, 10,000 documents, for if the typical user has his expected search length reduced from the 5,000 documents to be expected from a random search down to only ten documents, his search efforts will usually meet with early success. On the other hand, in a large collection of, say, 1,000,000 documents, it is questionable whether a reduction factor of only 99.8 per cent would be worth striving for. Even if optimal use were made of all nonstandard clues, there would still be an expected search length in the neighborhood of 1,000 documents--a formidable number except for the more patient or desperate of the library patrons. This is

not to say that all requesters would have so large an expected search length. Those of them who were able to supply an above-average amount of nonstandard information with above-average confidence in its accuracy could expect better retrieval results. However, a minority would find the special facilities to be of real value. One is led to the tentative conclusion that the nonstandard information which could be supplied by a patron who has had previous contact with a document would by itself usually be adequate in small collections, but inadequate in large collections, for the location of the document with a modicum of search effort on the patron's part.

If the patron can remember some fragment of standard information in addition to the nonstandard information, the picture changes. Suppose, for example, that he is able to remember that the work he wants comes under the subject heading "Psychology," but he can remember neither author nor title, nor can he supply more specific subject headings. A library of a million documents might have, say, 10,000 documents under this heading, in which case his single piece of standard information would by itself be hopelessly inadequate for retrieval purposes. Retrieval could nevertheless be effected in most such instances if the patron were able to supplement this subject heading information with nonstandard information; for his subject heading information in effect makes it a small collection which must be searched instead of a large one. The same would hold true of any other fragment of standard information which could be used to "narrow down" a large collection prior to a search using nonstandard information. Nonstandard information which is by itself inadequate for retrieval may become adequate when supplemented by whatever fragments of standard information are available, and this observation tempers somewhat the pessimism of the previous conclusion stating that nonstandard information would usually be useless for retrieval in very large collections. The reader is referred to [3] for data on the types and amounts of fragmentary author-title-subject information which are likely to be remembered by patrons who have had previous contact with a document.

11. Summary

The two most significant findings of the research were the following:

1. The relative usefulness for purposes of specific work retrieval of the various types of nonstandard book information which were investigated are likely to be approximately as indicated by the ranking in Table 2. (This ranking assumes a collection makeup similar to that of the University of Chicago library.)

2. The amount by which the average specific work requester's expected search effort could be reduced by providing him with an appropriate retrieval system to exploit his nonstandard information is a ratio on the order of 500 to one. (This very approximate figure assumes that the nonstandard information to be elicited from the user is somewhat more extensive than that investigated in the experiment. It is understood that the figure has relevance only to the requester of a specific work who is already acquainted with the physical document but cannot remember enough standard author-title-subject information about it to look it up on this basis alone.) Such a ratio would normally be adequate for convenient retrieval in small document collections, but inadequate in large collections except in cases where the nonstandard information can be supplemented by some fragment of standard information.

It is interesting to speculate whether the retrieval usefulness of nonstandard information could be enhanced by allowing each reported piece of nonstandard information to be accompanied by an indication of the degree of confidence which the person reporting it has of its accuracy. This could be done, for example, by means of a three-choice supplementary question asking him whether he is "certain," "fairly sure," or "not at all sure" of the accuracy of the answer he has given to a main question about a nonstandard feature. This supplementary information would introduce another level of complexity into all probability calculations, but might increase retrieval effectiveness considerably. There are also other additions and refinements which would probably improve the list of

twenty-four questions considered in this paper; for example, one could add questions on loan status (e.g., "Is the book a two-day book or a two-week book?"), on past circulation data (e.g., "Have you taken the book out before?" "If not, can you name anyone who has?"), and on a number of other physical characteristics such as weight or thickness. A few additional questions beside the twenty-four were in fact asked in the experiment; the results are reported in [3]. A final possibility for improving the retrieval effectiveness of nonstandard information would be to bring circulation data into play to further improve the prior probability estimates used in the document ranking presented as final output to the user. A simple rule for so doing would be: Within each rank of the ranking established on the basis of the nonstandard information, order the individual documents according to the number of times each has been withdrawn from the library within the past year. More sophisticated rules of greater potential value could obviously be formulated, and there is hope that a very substantial further reduction in expected search length could be achieved through such methods. It is especially recommended that this last possibility be investigated in any future research on the subject.

## 12. Acknowledgments

The findings reported here were obtained as a result of the combined efforts of the entire University of Chicago catalog research group. They are by no means attributable solely or even largely to the present writer, whose contribution was, in fact, restricted to the development of methods for analyzing and evaluating the experimental data. The conception, design, and execution of the memory experiment, as well as most of the actual numeric computations involved in analyzing its results, were carried out by the other members of the groups.

I am indebted also to Robert K. Tsutakawa, Peter Burns, and Jim Landwehr for individual assistance with some of the more detailed statistical work.

## References

[1] Montague, E., "Card Catalog Use Studies, 1949-1965," unpublished Master's dissertation, Graduate Library School, University of Chicago, 1967.

[2] Blackburn, M., "Information about Books Known by Users of the Catalog Who Are Looking for a Particular Work," unpublished Master's dissertation, Graduate Library School, University of Chicago, 1968.

[3] Vaughan, D., "Memorability of Book Characteristics: An Experimental Study," pp. 3-12 above.

[4] Cooper, W., "Expected Search Length: A Single Measure of Retrieval Effectiveness Based on the Weak Ordering Action of Retrieval Systems," American Documentation, XIX (January, 1968), 30-41.

[5] Jeffreys, Harold Theory of Probability, 3d ed., Oxford, Clarendon Press, 1961.

# APPENDIX A

## MATERIALS USED IN EXPOSURE AND TESTING SESSIONS OF BOOK-MEMORY EXPERIMENT

PART I

1. Please fill in the information requested on the next page. Then look over the list of books and choose ten you think you would like to look at. Do not choose any book that you have already read or heard of before, and do not spend more then three or four minutes deciding which books to look at.

2. Once you have chosen ten books, find them in the right-hand book stack (which is arranged alphabetically by authors) and take them to the desk. Be sure that you have gotten the right books before you go on.

3. Examine each book as carefully as you can in the 45 minutes allotted for the rest of the session (both no. 3 and no. 4). Grade each book according to how interesting it is to you, and put it in one of the following categories:

   A. Very interesting, and you would like to read it.
   B. Interesting
   C. Dull
   D. Very dull, and you would not like having to read it.

   Mark on the list which category you assign to each book. Do this for the entire ten.

4. Then pick out five books and write a comment or phrase characterising a part of each book that you found particularly interesting or outstanding. Your comment should be a full identification of your interest. That is, it should be understandable to someone who does not have the book before them. Write your comments on the list in the space left under each book.

   When you have finished, return these instructions and the list.

PART I

Name_____
Academic Status_____
Subject Field_____
Previous contact with psychology (courses, etc.)_____
_____

| | |
|---|---|
| Adler, Mortimer J. | What Man Has Made of Man |
| Baudouin, Charles | Psychoanalysis and Aesthetics |
| Bier, William C., ed. | The Adolescent; his search for understanding |
| Bull, Nina | The Attitude Theory of Emotion |
| Crane, Edward Villeroy | My Minds and I |
| David, Henry P., ed.<br>Bracken, Helmut von, ed. | Perspectives in Personality Theory |
| Eaton, Joseph W. | Culture and Mental Disorders |
| Fiebleman, James K. | Mankind Behaving; human needs and material culture |
| Gates, Georginia Stickland | The Modern Cat |
| Griffiths, Ruth | The Abilities of Babies |

| | |
|---|---|
| Helleberg, Carl Gustaf, ed. | Spirit Communications; a book written by the spirits of the so-called dead... |
| Isaacson, Robert L.<br>Hutt, Max L.<br>Blum, Milton L. | Psychology; the science of behavior |
| Kellogg, W. N. and L. A. | The Ape and the Child |
| Laslett, Peter, ed. | The Physical Basis of Mind |
| Lewis, Don | Quantitative Methods in Psychology |
| Marcuse, F. L. | Hypnosis; fact and fiction |
| Messick, Samuel<br>Ross, John | Measurement in Personality and Cognition |
| Munn, Norman L. | Psychology; the fundamentals of human adjustment |
| Oliver, John Rathbone | Fear; the autobiography of James Edwards |
| Piddington, Ralph | The Psychology of Laughter |
| Pratt, Carroll C. | The Logic of Modern Psychology |

| | |
|---|---|
| Richet, Charles | Idiot Man |
| Rogers, Carl R. | Counseling and Psychotherapy |
| Sidis, Boris | The Psychology of Suggestion |
| Stern, George G.<br>Stein, Morris I.<br>Bloom, Benjamin S. | Methods in Personality Assessment |
| Thomas, John F. | Beyond Normal Cognition |
| Tolman, Edward Chace | Drives Toward War |
| Von Fange, Eugene K. | Professional Creativity |
| Weinberg, Henry<br>Hire, William A. | Case Book in Abnormal Psychology |
| Wolberg, Lewis R. | The Technique of Psychotherapy |

PART II of this experiement tests recall of information about the books you examined during Part I of the experiment. You will be given a series of tests to see how much you can remember about these books. We are interested in finding out what kinds of things are remembered about books, what types of clues aid memory, and what characteristics of books are most memorable.

Three separate sections, each presenting a slightly modified approach, make up this part. As you finish each section, notify the examiner that you have done so, and you will be given the next section. Take as much time as you need; however, once you have indicated that you have completed a section, please do not make any changes, even insignificant ones (e.g. spelling, additions, substitutions, punctuation) in your written responses to the previous sections.

Be sure you understand the directions before beginning each section.

Note: After Part II, there will be another part to the experiment.

PART II

1. On the cards provided, please reconstruct the commen or descriptive phrases you made for the five of the ten books ou examined during Part I of this experiment. With each commen lease record everything you can remember, even though vague, fragmentary, or seemingly unimportant, about that book.

   If you are unable to reconstruct your comment, but can remember some information about the book, please record this information also.

   Please number the cards from one to five, and use the pen provided.

PART II

2. The following checklists represent some possible characteristics of books. Using one checklist for each of the five books, please indicate all characteristics which you can now remember about each book but which you were unable to remember, or which did not occur to you in the previous section. Your answers from Section 1 should have been returned to you; if they were not, please ask for them.

   If you wish to change any of your answers from Section 1, please record the change on the checklist, and not on the answer cards. Please number the checklists to correspond with the answer cards, and keep together the cards and checklists that describe the same book. Also, please use the pen provided.

   Fill in or check the appropriate information on the checklist, trying to describe the book as well as you can. The following are a series of special instructions on filling out the checklist.

   1. Author no special instructions
   2. Title no special instructions
   3. Type of work. If you really feel that the book cannot be placed in a single category, you may check as many as you think necessary to describe the book.
   4. Level of readers. As in the preceding section, check more than one category if you think it is really necessary.
   5. Subject no special instructions
   6. Physical characteristics
      Color If the book had more than one color, please check all the appropriate colors on the checklist.
      Size Samples of size and thickness are displayed. Please give both the <u>size</u> and <u>thickness</u> of the samples that are closest to the book you are describing.
      Number of pages An interval or span of pages is an acceptable description here.
   7. Location no special instructions
   8. Publication
      Date If you cannot remember the exact date, you can give an approximate date or an interval that covers the time in which the book was published.
   9. Bibliographic features. On this question you are asked to indicate yes or no for several characteristics. Please add a third column, "don't know," and mark it for those characteristics about which you remember nothing.

PART II

Name_____

1. Author_____

   Do you know any details about the author that might help to identify him?

   _____

2. Title_____

   If you think this is not the exact title, what other possibilities may be correct?_____

3. Type of work. Please indicate the category you think best describes the work?

   ____Handbook
   ____General textbook
   ____Introduction to a subject
   ____Monograph covering a single aspect of a field
   ____Collection of various writings by one or a number of authors
   ____Biography, autobiography, or work chiefly about a person
   ____History of a subject or discipline
   ____Self-improvement, self-help, self-understanding, etc.
   ____Research report
   ____Thesis or dissertation
   ____Report of a single case study
   ____Other. Please specify_____

4. Level of readers for which intended

   ____Popularization
   ____Treatment understandable to the general educated layman
   ____Work for beginning college students
   ____Work for advanced students or professionals
   ____Other. Please specify_____

5. Subject. (Describe as specifically as you can in a few words)_____

   _____

   Do you remember any specific details from the book, for example, chapters, topics, examples, discussions, incidents, etc.? Please describe_____

6. Physical characteristics

   Color (Check the choice that most accurately describes the book)

   ____blue or blue-green
   ____brown or tan
   ____orange
   ____grey
   ____black, dark grey, dark blue, etc.
   ____red
   ____white
   ____green
   ____purple or violet
   ____yellow

If you don't remember the exact color, was the book ____a light color ____a dark color ?

Did the cover of the book have any characteristics other than a solid color and/or printing? Please check any descriptions that apply.

____two-color binding
____marbled cover
____patterned cover
____illustration on cover
____design of some kind on cover

Type of printing

____library binding or rebinding
____spiral binding
____cloth publisher's binding
____library-reinforced paperback
____paper-covered board
____pamphlet binding
____leather binding
____Other_____

Condition of book

____new
____fairly new
____somewhat used
____worn
____bad

Kind of illustrations (if any)_____

Smell_____

Approximate size_____

Kind of printing_____

Approximate number of pages_____

Typographical layout and arrangement of the book_____

_____

7. Location

Shelf_____

Approximate location on shelf_____

Call number_____

Publication

8. Date of publication_____

Publisher_____

Type of publisher_____

Place of publication_____

Name of series (if any)_____

Translated?_____ If so, from what language?_____

Is the book a reprint or a revised edition?_____

9. Bibliographic features. Please indicate whether each of the following is included in the book.

| YES | NO | |
|---|---|---|
| ____ | ____ | index |
| ____ | ____ | bibliography or suggested readings |
| ____ | ____ | footnotes |
| ____ | ____ | chapter titles (list any you remember) |
| ____ | ____ | tables |
| ____ | ____ | graphs |
| ____ | ____ | problems at ends of chapters |
| ____ | ____ | case studies |
| ____ | ____ | glossary |
| ____ | ____ | dedication If so, to whom?_____ |
| ____ | ____ | prefatory material |
| ____ | ____ | quotations from literary works |
| ____ | ____ | figures, charts, diagrams |
| ____ | ____ | Is the book a single-volume book? |

PART II

3. The following is a list of the five comments you made during Part I of the experiment. With these as a reminder, supplement or change the information you provided about each of the five books on the checklists you used previously.

   If these comments bring to mind one of the five books which you did not remember before, please fill in another checklist for this book.

   Please note beside the comments on this page the numbers of the cards and checklists that describe the book that goes with each comment. Or, if you cannot match these comments with the cards and checklists, please note this fact.

   Please use the pen provided.

PART II

3a. After you have completed the three sections of Part II, please return to the checklists used in Section 2 (use the blank space at the bottom of the last page) and:

1) Compose what you would consider to be a good descriptive title for each book

2) List a subject heading or headings under which you would look in order to locate the book in the Harper catalog.

## PART III

1. Please examine the book list you are given and mark with a check the ten books you examined during Part I of the experiment. Place a double check by the five books you commented on.

AUTHOR-TITLE LIST

| | |
|---|---|
| Adler, Gerhard | The Living Symbol; a case study in the process of Individuation |
| _____ | Social Interest, a Challenge to Mankind |
| Adler, Mortimer J. | Topics in Psychology for Students of Law |
| _____ | What Man Has Made of Man |
| Adrian, E.D. | The Basis of Sensation |
| _____ | The Social Life of Chimpanzees |
| Alexander, Franz | Fundamentals of Psychoanalysis |
| _____ | The Psychoanalysis of the Total Personality |
| Allport, Gordon W. | Mental Maladjustments in Normal People |
| _____ | Personality; a psychological interpretation |
| Anastasi, Anne | Experimental Psychical Research |
| _____ | Psychological Testing |
| Andrews, T.G., ed. | Methods in Personality Assessment |
| _____ | Methods of Psychology |
| Angell, James Rowland | Human Behavior and Science |
| _____ | An Introduction to Psychology |
| Angyal, Andras | Foundations for a Science of Personality |
| _____ | The Fundamentals of Human Adjustment |
| Arnold, Magda B. | Hidden Remnants |
| _____ | Story Sequence Analysis |
| Baldwin, Alfred L. | Behavior and Development in Childhood |
| _____ | Moral Adjustment in Children |
| Barry, Frederick | The Scientific Habit of Thought |
| _____ | Words as Traitors |
| Bartley, Samuel Howard | Beginning Experimental Psychology |
| _____ | Psychology: a Behavioral Science |
| Bass, Bernard M. & Irwin A. Berg, eds. | Textbook of Abnormal Psychology |
| _____ | Objective Approaches to Personality Assessment |
| Baudouin, Charles | Psychoanalysis and Aesthetics |
| _____ | The World of Psychoanalysis |
| Beck, Samuel J. | The Human Senses |
| _____ | Rorschach's Tests |
| Beers, Clifford Whittingham | A Mind that Found Itself |
| _____ | Techniques of Persuasion |
| Bennett, Margaret E. | Guidance and Counseling in Groups |
| _____ | New Directions in Psychology |
| Bently, John Edward | Superior Children |
| _____ | The Normal Child and Some of His Abnormalities |
| Berg, Charles | Deep Analysis |
| _____ | Inner Lights |
| Berg, Jan Hendrick Van den | The Changing Nature of Man |
| _____ | The Dynamics of the Psyche |
| Berne, Eric | Games People Play |
| _____ | Psychology of Laughter |
| Bernhardt, Karl S. | The Art of Relaxation |

| | |
|---|---|
| _____ | Practical Psychology |
| Bier, William C., ed. | The Adolescent; his search for understanding |
| _____ | After Childhood |
| Bindra, Dalbir | Existence and Therapy |
| _____ | Motivation, a Systematic Reinterpretation |
| Bischof, L.J. | Brain Mechanisms and Consciousness |
| _____ | Intelligence; statistical concepts of its nature |
| Blake, Robert R. & Glenn V. Ramsey | The Organization of Behavior |
| _____ | Perception; an approach to personality |
| Bovet, Richard | Pandaemonium |
| _____ | Public Opinion and Propaganda |
| Brennan, Robert Edward | History of Psychology |
| _____ | Hypnotism |
| Briggs, Katharine May | Pale Hecate's Team |
| _____ | The Happy Medium |
| Broad, C.D. | The Mind and its Place in Nature |
| _____ | Reason and Emotion |
| Broadley, Margaret E. | Behavior Pathology |
| _____ | Square Pegs in Round Holes |
| Brown, Norman Oliver | Life Against Death |
| _____ | Unconsciousness |
| Buckham, John Wright | Personality and Behavior |
| _____ | Personality and Psychology |
| Bull, Nina | The Attitude Theory of Emotion |
| _____ | What Is Your Emotional Age? |
| Butler, Judson Rea & Theodore F. Karwaske | How Man Plays |
| _____ | Human Psychology |
| Cameron, Norman | The Psychology of Behavior Disorders |
| _____ | Value Measurement |
| Cantril, Hadley & Charles Heath Bumstead | Professional Creativity |
| _____ | Reflections on the Human Venture |
| Chase, Stuart | The Achievement Motive |
| _____ | The Tyranny of Words |
| Clarke, Edwin Leavitt | The Art of Straight Thinking |
| _____ | The Nature of the Mind |
| Cobb, Stanley | Foundations of Neuropsychiatry |
| _____ | The Nature of Prejudice |
| Cohen, Yehudi A. | Personaltiy Development in Children |
| _____ | Social Structure and Personality |
| Comber, Leon | Chinese Magic and Superstition in Malaya |
| _____ | Varieties of Human Physique |
| Comparative Psychology | |
| Cornish, Charles Joseph | Animals and Man |
| _____ | Animals at Work and Play |
| Costello, Timothy W. & Zalkind, Sheldon S. | Psychology in Administration |
| _____ | The Psychology of Suggestion |
| Crane, Aaron Martin | Feelings and Emotions |
| _____ | Right and Wrong Thinking and Their Results |

| | |
|---|---|
| Crane, Edward Belleroy | Language and Communication |
| | My Minds and I |
| _____ Culbertson, James T. | Consciousness and Behavior |
| | Mind in Evolution |
| _____ Cumont, Franz | Astrology and Religion Among the Greeks and Romans |
| | History of Psychology |
| _____ Curran, Charles A. | Personality Factors in Counseling |
| | Principles of Personality Counseling |
| _____ Darwin, Charles | Bodily Changes in Pain, Hunger, Fear, and Rage |
| _____ | Expression of the Emotions in Man and Animals |
| David, Henry P. & Helmut Von Bracken, eds. | Culture and Personality |
| | Perspectives in Personality Theory |
| _____ Davidson, Thomas | Rowan Tree and Red Thread |
| | Theories of Witchcraft |
| _____ Dempsey, Peter J.R. | Freud, Psychoanalysis, Catholicism |
| | Sigmund the Unserene |
| _____ Dorcus, Roy M. & G. Wilson Shaffer | Existentialist Psychiatry |
| | Textbook of Abnormal Psychology |
| _____ Dresser, Haratio W. | Human Efficiency |
| | Intelligence and Experience |
| _____ Duffy, Elizabeth | Activation and Behavior |
| | Inner Conflict and Defense |
| _____ Duggan, Anne Schley | A Comparative Study of Undergraduate Women Majors and Non-majors in Physical Education with Respect to Certain Personal Traits |
| | Developmental Psychology |
| _____ Eaton, Joseph W. & Robert J. Weil | Culture and Mental Disorders |
| | Current Studies in Psychology |
| _____ Educational and Psychological Measurement. Vol. 10, no. 1, Spring 1950 | |
| Elkin, Frederick | A Comparative Analysis of a Life History |
| | Explanation of Behavior |
| _____ English, Horace Bidwell | Conditioning and Learning |
| | The Historical Roots of Learning Theory |
| _____ Estabrooks, G.H. | Hypnotism |
| | Spirit Communications |
| _____ Evans, Jean | Conceptual Framework of Psychology |
| _____ | Three Men; an experiment in the biography emotion |
| Fay, Jay Wharton | American Psychology Before William James |
| | Clinical Psychology |
| _____ Fiebleman, James K. | Mankind Behaving |
| | Play Activities and Psychology |
| _____ Feleky, Antoinette | Feelings and Emotions |
| | The Pupil's Thinking |
| _____ Fenichel, Hanna & David Rapaport, eds. | The Collected Papers of Otto Fenichel |
| | Freud and the Post-Freudians |
| _____ | |

| | |
|---|---|
| Ferguson, Leonard W. | Method and Theory in Experimental Psychology |
| | Personality Measurement |
| _____ Fite, Warner | Human Efficiency |
| | The Living Mind |
| _____ Flugel, J.C. | Foundations of Psychology |
| | A Hundred Years of Psychology |
| _____ Fornell, Earl Wesley | Spirits and Realism |
| | The Unhappy Medium |
| _____ Fosdick, Harry Emerson | On Being a Real Person |
| | Why Worry? |
| _____ Frederick, J. George | Neurotic Personality of Our Time |
| | What is your Emotional Age? |
| _____ Freeman, Graydon LaVerne | The Energetics of Human Behavior |
| | Introduction to Physiological Psychology |
| _____ | Physiological Psychology |
| _____ Freud, Sigmund | Beyond the Pleasure Principle |
| | Interpretation of Dreams |
| _____ | Totem and Taboo |
| _____ Fromm, Erich | Escape from Freedom |
| | The Forgotten Language |
| _____ Gardner, Edward L. | Fairies; the Cottingley photographs and their sequel |
| | Inside a Dark Room |
| _____ Garrett, Henry E. | General Psychology |
| | Social Psychology |
| _____ Gates, Georgina Stickland | Animal Behavior |
| | The Modern Cat |
| _____ Gemant, Andrew | The Nature of the Genius |
| | Principles of Psychology |
| _____ Gendlin, Eugene T. | Experiencing and the Creation of Meaning |
| | The Meaning of Anxiety |
| _____ Gesell, Arnold, & Ilg, Frances L. | Child Development |
| Gesell, Arnold, & Thompson, Helen | The Psychology of Early Growth |
| Goldsmith, Joel S. | Life of the Robin |
| | A Parenthesis in Eternity |
| _____ Goldstein, Kurt | Language and Language Disturbances |
| | Verbal Behavior and Learning |
| _____ Gordon, Jesse E. | Personality and Behavior |
| | Psychoanalysis and Personality |
| _____ Goslin, David | The Search for Ability |
| | Theory of Mental Tests |
| _____ Griffiths, Joseph Henry | The Psychology of Human Behavior |
| | Psychology in Industry |
| _____ Griffiths, Ruth | The Abilities of Babies |
| | The Happy Child |
| _____ Groos, Karl | The Play of Man |
| | The Scientific Study of Social Behavior |
| _____ Guilford, J.P., ed. | Fields of Psychology |
| | Psychological Theory: Contemporary Readings |
| _____ Harsh, Charles M., & Schrickel, H.G. | Personality; development and assessment |

| | |
|---|---|
| _____ | Personality in Nature, Society, and Culture |
| Hart, Hornell | Autoconditioning; the new way to a successful life |
| | Directed Thinking |
| _____ | Biopsychology and Behavior |
| Hathaway, S.R. | Physiological Psychology |
| _____ | The Language of Psychobiology |
| Hayek, F.A. | The Sensory Order |
| _____ | Conflict, Arousal, and Curiosity |
| Heath, Robert G., ed. | The Role of Pleasure in Behavior |
| _____ | Communication Through Mediums |
| Helleberg, Carl G., ed. | Spirit Communications |
| _____ | Existence |
| Hilgard, Ernest R. | Theories of Learning |
| _____ | The Geography of Witchcraft |
| Hill, Douglas, & Williams, Pat | The Supernatural |
| _____ | Genius and Creative Intelligence |
| Hirsch, Nathaniel D.M. | Man and Genius |
| _____ | Anxiety |
| Hobhouse, L.T. | Mind in Evolution |
| _____ | Psychology and Ethics |
| Hollingworth, Harry L. | Shame and Guilt |
| _____ | Ego and Mechanisms of Defense |
| Holmes, Oliver Wendell | Mechanism in Though and Morals |
| _____ | Culture and Personality |
| Honigmann, John Joseph | A Short History of Psychology |
| _____ | Behaviorism |
| Hopkins, Prynce | Orientation, Socialization, and Individuation |
| _____ | Individual Psychology of Ernest Holmes |
| Hornaday, William H.D., & Wave, Harlan | The Inner Light |
| _____ | Are You Considering Psychoanalysis? |
| Horney, Karen, ed. | Neurotic Personality in Our Time |
| _____ | The Psychology of Adolescence |
| Horrocks, John E. | Sex and Behavior |
| _____ | Beyond Normal Cognition |
| Hulin, Wilbur S. | A Short History of Psychology |
| _____ | Aptitude Testing |
| Hull, Clark L. | Intelligence Testing |
| _____ | Encyclopedia of Biblical Spiritualism |
| Hull, Moses | Mankind So Far |
| _____ | Childhood and After |
| Isaacs, Susan | The Normal Child and His Development |
| _____ | General Psychology |
| Isaacson, Robert L. | Psychology: the science of behavior |
| Isaacson, Robert L., & Hutt, Max L., & Blum, Milton L. | Experimental Design in Psychological Research |
| Ittelson, William H., & Kutash, Samuel B. | Perceptual Changes in Psychopathology |
| _____ | |

| | |
|---|---|
| Jacobson, Edmund | The Psychology of Suggestion |
| _____ | You Must Relax |
| Jennings, Helen Hall | Leadership and Isolation |
| _____ | Uses and Abuses of Psychology |
| Jones, Marshall R., ed. | Nebraska Symposium on Motivation, 1956 |
| Jones, Richard M. | Ann Application to Psychoanalysis to Education |
| _____ | Principles of Gestalt Psychology |
| Josselyn, Irene M. | The Happy Child |
| _____ | Adolescent Fantasy |
| Jung, C.G. | The Development of Personality |
| _____ | The Interpretation of Nature and the Psyche |
| _____ | Two Essays on Analytical Psychology |
| Kantor, J.R. | Applied Experimental Psychology |
| _____ | The Scientific Evolution of Psychology |
| Kawin, Ethel | The Ape and the Child |
| _____ | Children of Preschool Age |
| Keller, Fred S., & Schoenfeld, William N. | Clinical Psychology |
| _____ | Principles of Psychology |
| Kellogg, W.N., & L.A. | The Ape and the Child |
| _____ | The Chimp and the Child |
| Kelly, George A. | Culture and Personality |
| _____ | The Psychology of Personal Constructs |
| Kenmare, Dallas | Stolen Fire; a study of genius |
| _____ | The Nature of Genius |
| Krech, David | Psychology of Perception |
| Krech, David, & Crutchfield, Richard S. | Elements of Psychology |
| Krech, David, & Klein, George J., eds. | Theoretical Models and Personality Theory |
| Kimble, Gregory A. | A Handbook of Clinical Psychology |
| _____ | Principles of General Psychology |
| Klein, David B. | General Psychology |
| _____ | Masochism and Sadism |
| Kline, Milton V., ed. | Existence and Therapy |
| _____ | Hypnodymanic Psychology |
| Kluckhorn, Clyde, & Murray, Henry A., eds. | Dynamics of Anxiety and Hysteria |
| _____ | Personality in Nature, Society, and Culture |
| Kochs, S.C. | Intelligence Measurement |
| _____ | The Mentality of Apes |
| Kohler, Wolfgang | Gestalt Psychology |
| _____ | A Primer of Gestalt Psychology |
| Lang, Martin | Character Analysis Through Color |
| _____ | Wake Up Your Mind |
| Langer, Walter C. | Psychology and Human Living |
| _____ | Stress |
| Laslett, Peter, ed. | Mechanism in Thought |
| _____ | The Physical Basis of Mind |

| | |
|---|---|
| Law, Stanley G. | Motivation and Emotion |
| _____ | Therapy Through Interview |
| Leeming, Benjamin C. | Imagination; mind's dominant power |
| _____ | Psychology of Ego Involvements |
| Leeper, Robert W., & Madison, Peter | Psychoanalysis as a Science |
| _____ | Toward Understanding Human Personality |
| Lehman, Harvey C., & Witty, Paul A. | Children's Thinking |
| _____ | The Psychology of Play Activities |
| Levitas, G.B. | Contemporary Trends in Psychology |
| _____ | The World of Psychoanalysis |
| Lewin, Kurt | Principles of Topological Psychology |
| _____ | Psychometric Methods |
| Lewis, Don | Pioneering in Psychology |
| _____ | Quantitative Measurement in Psychology |
| _____ | Quantitative Methods in Psychology |
| Liebman, Samuel, ed. | Anxiety |
| _____ | Stress Situations |
| Lilly, William | A Short History of Psychology |
| _____ | William Lilly's Hostory of his Life and Times |
| Link, Henry C. | Dictionary of Spiritualism in the Bible |
| _____ | Rediscovery of Man |
| Loehrich, Rolf Rudolf | The Interpretation of Dreams |
| _____ | Oneirics and Psychosomatics |
| Lorimer, Frank | The Growth of Reason |
| _____ | Theoretical Basis of Human Reason |
| MacAndrew, Craig | Alienation and the Office Worker |
| _____ | Organization and Pathology of Thought |
| McClelland, David C. | The Achievement Motive |
| _____ | Personality |
| McCosh, James | The Emotions |
| _____ | What is Your Emotional Age? |
| McCurdy, Harold Grier | Eroticism |
| _____ | The Personal World |
| McDougall, William | Outline of Psychology |
| _____ | Productive Testing |
| McGeoch, Grace O. | The Human Senses |
| _____ | The Retention of Observed Material |
| Mackay, Charles | Extraordinary Population Delusions and Madness of Crowds |
| _____ | A Parenthesis in Eternity |
| Macmurray, John | Normal Emotions |
| _____ | Reason and Emotion |
| Marcuse, F.L. | Client-centered Therapy |
| _____ | Hypnosis; Fact and Fiction |
| Marston, William Moulton | Emotions of Normal People |
| _____ | Principles of Personality Counseling |
| May, Rollo | The Meaning of Anxiety |
| May, Rollo, & Angel, Ernest, & Ellenberger, Henri J. | Existence; a new dimension in psychiatry and psychology |

| | |
|---|---|
| Meerloo, Joost A.M. | The Mind in Evolution |
| _____ | The Rape of the Mind |
| Merloau-Ponty, Maurice | Behavior Theory and Conditioning |
| _____ | The Structure of Behavior |
| Menninger, Kark, & Menninger, Jeanetta Lyle | Love Against Hate |
| _____ | Myth and Guilt |
| Messick, Samuel, & Ross, John | Measurement in Personality and Cognition |
| _____ | Productive Testing |
| Miller, Clyde R. | The Process of Persuasion |
| _____ | The Psychology of Perception |
| Miller, James Grier | Death and Identity |
| _____ | Unconsciousness |
| Monroe, Marion | Aptitude Testing |
| _____ | Children Who Cannot Read |
| Morgan, Clifford, & Stellar, Eliot | An Autobiography of Fear |
| _____ | Physiological Psychology |
| Moore, Robert E. | The Human Side of Successful Communication |
| _____ | Invisible Forces |
| Moss, Fred A. | Applications of Psychology |
| _____ | The Development of Personality |
| Munn, Norman L. | Psychology |
| _____ | Readings in Social Psychology |
| Murchison, Carl, ed. | Psychologies of 1925 |
| Murphy, Gardner, & Spohn, Herbert | An Introduction to Psychology |
| Murphy, Gardner | Personality; a biosocial approach to origins and structure |
| Murray, J. Clark | An Introduction to Psychology |
| _____ | Pale Hecate's Team |
| Mursell, James L. | Psychologocial Testing |
| _____ | Science and Human Behavior |
| Mussen, Paul H. | Childhood and Adolescence |
| _____ | The Psychological Development |
| Nice, Richard W., & Podolsky, Edward | A Handbook of Abnormal Psychology |
| _____ | Idiot Man |
| O'Connor, Johnson | Psychometric Methods |
| _____ | Psychometrics |
| Ogden, C.K. | Hatred and the Theory of Instinct |
| _____ | The Meaning of Psychology |
| Ogden, Robert M. | An Introduction to General Psychology |
| _____ | The Psychology of Music |
| O'Hara, Frank J. | Psychology and the Nurse |
| _____ | A Study of Color Vision |
| Oliver, John Rathbone | Fear; the autobiography of James Edwards |
| _____ | Sleep and Wakefulness |
| Oliver, Robert T., & Barbara, Dominick A. | The Healthy Mind in Communion and Communication |
| _____ | A Study of Thinking |

| | |
|---|---|
| Osborn, Alex | Wake Up Your Mind |
| | Your Creative Power |
| _____, Overstreet, H.A. | Influencing Human Behavior |
| | The Power of Sexual Surrender |
| _____, Parida, Gurupada | Devices for Understanding Human Behavior |
| | Popular Superstitions among College Students in India |
| _____, Parsons, Sir John Herbert | A Factorial Study of Perception |
| | An Introduction to the Study of Color Vision |
| _____, Piaget, Jean | The Child's Conception of Physical Reality |
| | The Child's Conception of Physical Causality |
| | The Moral Judgment of the Child |
| _____, Piddington, Ralph | Fragmentation During Hysteria |
| | The Psychology of Laughter |
| _____, Pigors, Paul, & Faith | Case Method in Human Relations |
| | Vigilance |
| _____, Pikunas, Justin | Environment and Inheritance |
| | The Psychology of Human Development |
| _____, Pillsbury, W.B. | The History of Psychology |
| Pillsbury, Walter B., & Meader, Clarence L. | The Psychology of Language |
| Pintner, Rudolph | Brain Mechanisms and Intelligence |
| | Intelligence Testing |
| _____, Pitkin, Walter B. | A Short Introduction to the History of Human Stupidity |
| | A Treatise on Parapsychology |
| _____, Pratt, Carroll C. | Clairvoyance and Telepathy |
| | The Logic of Modern Psychology |
| _____, Price, H.H. | Oracles of Nostradamus |
| | Perception |
| _____, Prince, Walter Franklin | Human Experience |
| | A Study of Stupidity |
| _____, Pulay, Erwin | Allergic Man; susceptibility and hypersensitivity |
| | Uses and Abuses of Psychology |
| _____, Ramus, Carl | Behind the Scenes with Ourselves |
| | The Fire of Genius |
| _____, Reik, Theodor | Genius and Creativity |
| | Myth and Guilt |
| _____, Reiss, Samuel | The Basis of Scientific Thinking |
| | A Study of Thinking |
| _____, Revesz, Geza | Color Vision |
| | Psychology and Art of the Blind |
| _____, Rhine, J.B. | Extra-sensory Perception |
| | Principles of Psychology |
| _____, Richet, Charles | Idiot Man; or the follies of mankind |
| | Natural History of Stupidity |
| _____, Rickers-Ovsiankina, Maria, ed. | Rorschach Psychology |
| | The Rorschach Test |
| _____, Roback, A.A. | Freudiana |
| | History of American Psychology |
| _____, | |

| | |
|---|---|
| Robinson, Edward S., & Kirk, Virginia | Introduction to Psychology |
| Robinson, Helen L. | Talks on Graphology |
| Robinson, James H. | The Mind in the Making |
| Rogers, Carl R. | Couseling and Psychotherapy |
| | The Integrity of Personality |
| _____ Russell, Willard L. | Invincible Forces |
| | New Minds for Old |
| _____ Saporta, Jack | Psychology of the Common Cold |
| _____ | A Study of Psychological Factors Related to Apparent Susceptibility and Resistance to Common Upper Respiratory Illnesses |
| Salisbury, Frank S. | Character Analysis Through Color |
| | Human Development and Learning |
| _____ Scot, Reginald | The Discoverie of Witchcraft |
| | Warriors of the Rainbow |
| _____ Seashore, Carl E. | Pioneering in Psychology |
| Seashore, Robert H., ed. | Fields of Psychology; an experimental approach |
| Shellow, Sadie M. | How to Develop Your Personality |
| | The Psychology of Laughter |
| _____ Sherif, Muzafer, & Cantril, Hadley | Origins of Consciousness |
| | Psychology of Ego Involvements |
| _____ Sidis, Boris | Man Meets Dog |
| | The Psychology of Suggestion |
| _____ Sidman, Murray | Group Dynamics; research and theory |
| | Tactics of Scientific Research |
| _____ Skinner, B.F. | Cumulative Record |
| | Science and Human Behavior |
| _____ Smith, Karl V., & Smith, William M. | The Behavior of Man |
| | The Principles of Behavior |
| _____ Spearman, C. | The Abilities of Man; their nature and measurement |
| | Assessment of Human Nature |
| _____ Starrett, D.W. | The Dancing Bees |
| | The Last Lap |
| _____ Stekel, Wilhelm | Abnormal Psychology |
| _____ | Sadism and Masochism; the psychology of hatred and cruelty |
| Stephenson, William | Maternal Behavior in the Rat |
| _____ | The Study of Behavior; Q-technique and its methodology |
| Stern, George G. | Interpretation of Dreams |
| Stern, George G., Morris I Stein, & Benjamin S. Bloom | Methods in Personality Assessment |
| Strong, Charles Augustus | The Origin of Consciousness |
| | Unconsciousness |
| _____ Stutsman, Rachel | Mental Measurement of Preschool Children |
| _____ | Patterns of Child-Rearing |

| | |
|---|---|
| Sudre, Rene | Sense and Nonsense in Psychology |
| _____ | Treatise on Parapsychology |
| Summers, Montague | The Allergies of Man |
| _____ | The Geography of Witchcraft |
| Sykes, Gerald | The Hidden Remnant |
| _____ | The Last Lap |
| Symonds, Percival M. | Adolescent Fantasy |
| _____ | The Dancing Mouse |
| Tabori, Paul | Astrology and Religion Among the Greeks |
| _____ | The Natural Science of Stupidity |
| Thomas, John F. | Beyond Normal Cognition |
| _____ | Inside Dreams |
| Thompson, Helen Bradford | Freud and the Post-Freudians |
| _____ | The Mental Traits of Sex |
| Thorndike, Robert L., & Elizabeth Hagen | Intelligence Testing |
| _____ | Measurement and Evaluation in Psychology and Education |
| Thouless, Robert H. | Clinical Psychology |
| _____ | Experimental Psychical Research |
| Thurstone, Louis Leon | The Measurement of Values |
| Thurstone, Louis Leon & Richard L. Jenkins | Order of Birth, Parent-Age, and Intelligence |
| Tischner, Rudolf | Sight Beyond |
| _____ | Telepathy and Clairvoyance |
| Titchener, Edward Bradford | An Outline of Psychology |
| _____ | Pattern and Growth in Psychology |
| Tolman, Edward Chace | Drives Toward War |
| _____ | The Nature of Human Conflict |
| Tomas, Vincent, ed. | Creativity in the Arts |
| _____ | The Psychology of Music |
| Valentine, Willard L. & Delos D. Wickens | Conceptual Framework of Psychology |
| _____ | Experimental Foundations of General Psychology |
| Vance, John G. | Human Ability |
| _____ | A Mirror of Personality |
| VanderVeldt, James Herman & Robert P. Odenwald | Psychiatry and Catholicism |
| _____ | Psychology and Religion |
| Varnum, Walter C. | Psychology in Everyday Life |
| _____ | Studies in Graphology |
| Vaughan, Wayland F. | General Psychology |
| _____ | Historical Events in Psychology |
| Vernon, Jack A. | Inside the Black Room |
| Vernon, Philip E. | Personality Tests and Assessments |
| Vinacke, William Edgar | The Psychology of Thinking |
| _____ | The Science of Thinking |
| VonFange, Eugene K. | The Nature of Genius |
| _____ | Professional Creativity |
| Wallin, J.E. Wallace | Minor Mental Maladjustments in Normal People |
| _____ | Psychological Statistics |

| | |
|---|---|
| Walton, George L. | A Psychological Study of Problem Solving |
| _____ | Why Worry? |
| Ward, Charles A. | Conditioning and Learning |
| _____ | Oracles of Nostradamus |
| Warner, Samuel J. | Drives Toward War |
| _____ | The Urge to Mass Destruction |
| Warren, Howard C. | Elements of Human Psychology |
| _____ | Natural History of Stupidity |
| Waters, Rolland H., ed. | Introduction to Psychology |
| Waters, Rolland H., N.A. Rethingshafter, & Willard E. Caldwell, eds. | Principles of Camparative Psychology |
| Watson, John B. | Psychology, a Behavioral Science |
| _____ | Psychology from the Standpoint of a Behaviorist |
| Wechsler, David | Genius and Creative Intelligence |
| _____ | Wechsler Intelligence Scale for Children |
| Weinberg, Henry & William A. Hire | Behavior of Men |
| _____ | Case Book in Abnormal Psychology |
| Weinland, James D. | General Psychology for Students of Business |
| _____ | Human Efficiency |
| Weiss, Albert Paul | The Energetics of Human Behavior |
| _____ | A Theoretical Basis of Human Behavior |
| Weitzenhoffer, Andre M. | Hypnotism; an objective study in suggestibility |
| _____ | Memory |
| Wertheimer, Max | Growth of Logical Thinking from Childhood to Adolescence |
| _____ | Productive Thinking |
| White, Robert W. | The Abnormal Personality |
| _____ | Analysis of Behavior |
| Willoya, William & Vinson Brown | Nature, Society, and Culture |
| _____ | Warriors of the Rainbow |
| Wingfield-Stratford, Esme W. | New Minds for Old |
| _____ | Sleep and Wakefulness |
| Wolberg, Lewis R. | Psychoanalysis and Personality |
| _____ | The Technique of Psychotherapy |
| Wolff, Werner | Essentials of Psychology |
| _____ | What is Psychology? |
| Woodworth, Robert S. | Contemporary Schools of Psychology |
| _____ | Experimental Psychology |
| _____ | Psychology |
| Wyatt, Horace G. | The Art of Feeling |
| _____ | Directed Thinking |
| Yerkes, Robert M. | The Chimp and the Child |
| _____ | Chimpanzees; a laboratory colony |
| Young, Paul Thomas | Emotion in Man and Animal |
| _____ | Experience of the Emotions in Man and Animal |
| Zuckerman, Sally | The Ape in Our House |
| _____ | The Social Life of Monkeys and Apes |

PART III

2. Look over the indicated book stack and see if you can find the ten books you examined during Part I of the experiment. Please do not look inside the books.

   Remove the books from the shelf, and then match up your cards and checklists with the books that they describe.

PART III

3. The ten books have been moved back to their original places in the book stack from which you took them. Please see if you can find them. Take the books from the shelves, and then match up the cards and checklists with the books that they describe.

# APPENDIX B

# BOOK-MEMORY EXPERIMENT DATA

# APPENDIX B

## BOOK-MEMORY EXPERIMENT DATA

Rose A. Spaith

The data presented in this appendix is the numerical data from which the tables in the text were derived. Data are arranged and numbered to correspond to checklist items regarding the various book characteristics. Data are arranged in matrices with the columns representing actual conditions of book characteristics and the rows representing experimentees' responses. The underlined figures, which, with a few exceptions, occur at the intersections of column and row, represent correct responses. Null responses appear in a separate row. Responses which are neither underlined nor in the "Null" row are incorrect.

The following characteristics are not presented in this appendix: Checklist items (1) and (2), Author and Title are fully presented in the text; numerical data appear on pages 21 and 23. Items (6g), (6k), and (6i), Smell, Kind of printing, and Typographical layout, were not tabulated because of the paucity of responses the items elicited. The few responses that were given were not descriptive of the nature of the characteristics. Item (5), Subject, was the subject of a separate investigation, reported in "Accuracy and Utility of Subject-Related Responses;" the numerical data are presented in that paper.

TABLE 3 (1)

TYPE OF WORK

DISTRIBUTION OF RESPONSES

| Response | Actual Type of Work of Object Books | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Multiple | | |
| | Handbook | Text | Introduction | Monograph | Collection | Biography | History | Self-help | Research Report | Thesis | Report of Case Study | Other | One or more Responses Correct | No Response Correct | |
| Handbook | 1 | 4 | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 7 |
| Text | .. | 13 | 2 | 15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 34 |
| Introduction | .. | 3 | 12 | 23 | 1 | .. | .. | .. | 5 | .. | .. | .. | .. | 2 | 46 |
| Monograph | .. | 1 | 4 | 35 | 3 | .. | 1 | 4 | 3 | .. | 1 | 1 | .. | 1 | 54 |
| Collection | 1 | .. | .. | 4 | 20 | .. | .. | 1 | .. | .. | .. | 3 | 1 | .. | 30 |
| Biography | .. | .. | 1 | 2 | .. | .. | .. | .. | 1 | .. | .. | .. | 1 | .. | 5 |
| History | .. | .. | .. | 9 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 10 |
| Self-help | .. | 1 | 1 | 1 | 2 | .. | .. | 8 | .. | .. | .. | .. | 1 | .. | 14 |
| Research report | .. | 1 | 1 | 14 | .. | .. | .. | .. | 14 | 1 | 1 | .. | 3 | 1 | 36 |
| Thesis | .. | .. | 1 | 11 | .. | .. | .. | .. | .. | 3 | 1 | .. | 1 | .. | 17 |
| Report of case study | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | 1 | .. | .. | .. | 3 |
| Other | .. | 1 | 1 | 37 | 4 | .. | .. | .. | 1 | .. | 2 | .. | .. | .. | 46 |
| Multi-response one correct | .. | 12 | 8 | 24 | 13 | 5 | 1 | 2 | 6 | 2 | .. | .. | 4 | .. | 77 |
| Multi-response all incorrect | .. | 4 | 2 | 34 | 8 | 1 | 1 | 1 | 5 | .. | .. | .. | .. | .. | 56 |
| No response | .. | .. | .. | 3 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 5 |
| Total | 2 | 40 | 33 | 214 | 56 | 6 | 4 | 16 | 37 | 6 | 6 | 4 | 11 | 5 | 440 |

TABLE 3 (2)

TYPE OF WORK

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 192 | 43.6 |
| Incorrect | 243 | 55.2 |
| Null | 5 | 1.2 |
| Total | 440 | 100.0 |

TABLE 4 (1)

LEVEL OF READERS

DISTRIBUTION OF RESPONSES

| Response | Actual Level of Object Books | | | | Total |
|---|---|---|---|---|---|
| | Popular | Generally Educated Layman | Beginning College Student | Advanced Student/ Professionals | |
| Popular | 12 | 34 | 2 | 4 | 52 |
| Generally educated layman | 5 | 56 | 11 | 57 | 129 |
| Beginning college student | .. | 15 | 4 | 21 | 40 |
| Advanced student/ professionals | .. | 6 | 10 | 88 | 104 |
| Multi-response correct | 5 | 35 | 9 | 26 | 75 |
| Multi-response wrong | .. | 4 | 3 | 23 | 30 |
| Other | .. | 2 | .. | 4 | 6 |
| No response | .. | .. | 1 | 3 | 4 |
| Total | 22 | 152 | 40 | 226 | 440 |

TABLE 4 (2)

LEVEL OF READERS

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 235 | 53.4 |
| Incorrect | 201 | 45.7 |
| Null | 4 | .9 |
| Total | 440 | 100.0 |

TABLE 6-a (1)

COLOR

DISTRIBUTION OF RESPONSES

| Response | Actual Color of Object Books | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue | Brown | Orange | Gray | Black | Red | White | Green | Purple | Yellow | Multi | |
| Blue | 13 | 1 | 1 | 1 | 6 | 4 | .. | 3 | .. | 1 | 6 | 36 |
| Brown | 4 | 6 | 2 | 1 | 4 | 16 | .. | 3 | 2 | 1 | 5 | 44 |
| Orange | .. | .. | .. | .. | .. | 2 | .. | .. | .. | 1 | 2 | 5 |
| Gray | 2 | .. | .. | 5 | 2 | 3 | .. | 3 | .. | 1 | 5 | 21 |
| Black | 20 | 4 | .. | 3 | 17 | 12 | .. | 3 | 1 | 2 | 14 | 76 |
| Red | 7 | 2 | 1 | .. | 2 | 23 | .. | 2 | .. | .. | 5 | 42 |
| White | 2 | .. | .. | 1 | 1 | 1 | .. | .. | .. | .. | 2 | 7 |
| Green | 6 | .. | .. | .. | 3 | 2 | .. | 4 | 1 | .. | 3 | 19 |
| Purple | 1 | .. | .. | .. | .. | 3 | .. | .. | 2 | .. | .. | 6 |
| Yellow | 1 | .. | .. | .. | .. | .. | .. | 1 | .. | 7 | 1 | 10 |
| Multi | 2 | 1 | .. | .. | 1 | 2 | .. | .. | .. | .. | 6 | 12 |
| No response | 32 | 5 | 1 | 10 | 35 | 36 | .. | 16 | 1 | 4 | 22 | 162 |
| Total | 90 | 19 | 5 | 21 | 71 | 104 | .. | 35 | 7 | 17 | 71 | 440 |

TABLE 6-a (2)

COLOR

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 83 | 18.9 |
| Incorrect | 195 | 44.3 |
| Null | 162 | 36.8 |
| Total | 440 | 100.0 |

TABLE 6-b

LIGHT OR DARK COLOR OF COVER

DISTRIBUTION OF RESPONSES

| Response | Actual Cover Shade of Object Books | | | Total |
|---|---|---|---|---|
| | Light | Dark | Both[a] | |
| Light | 33 | 39 | 9 | 81 |
| Dark | 35 | 114 | 14 | 163 |
| No response | 50 | 122 | 24 | 196 |
| Total | 118 | 275 | 47 | 440 |

[a]A number of books had bi-colored bindings; since both "light" or "dark" responses were problematic, "light" was considered correct.

LIGHT OR DARK COLOR OF COVER

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 156 | 35.4 |
| Incorrect | 88 | 20.0 |
| Null | 196 | 44.6 |
| Total | 440 | 100.0 |

TABLE 6-c (1)

COVER DETAIL

DISTRIBUTION OF RESPONSES

| Response | Actual Cover Detail of Object Books | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Two-color | Marbled | Pattern | Illustrated | Design | Nothing | |
| Two-color | 8 | .. | .. | .. | 2 | 14 | 24 |
| Marbled | .. | .. | .. | .. | 2 | 2 | 4 |
| Pattern | .. | .. | .. | .. | 2 | 1 | 3 |
| Illustrated | 1 | .. | .. | 5 | 2 | 3 | 11 |
| Design | 1 | .. | .. | 1 | 6 | 7 | 15 |
| Nothing[a] | 6 | .. | .. | 2 | 11 | 47 | 66 |
| Other | 1 | .. | .. | .. | 1 | .. | 2 |
| No response | 42 | 5 | .. | 2 | 34 | 232 | 315 |
| Total | 59 | 5 | .. | 10 | 60 | 306 | 440 |

[a]This response was written in by 66 respondents.

TABLE 6-c (2)

COVER DETAIL

SUMMARY OF RESPONSES

| Quality of Responses | Number | Percentage |
|---|---|---|
| Correct | 66 | 15.0 |
| Incorrect | 59 | 13.4 |
| Null | 315 | 71.6 |
| Total | 440 | 100.0 |

TABLE 6-d (1)

TYPE OF BINDING

DISTRIBUTION OF RESPONSES

| Response | Actual Binding of Object Books | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | Library Binding or Rebinding | Cloth Publisher's Binding | Spiral Binding | Library-reinforced Paperback | Paper-covered Boards | Pamphlet Binding | Leather Binding | |
| Library binding or rebinding | 20 | 40 | .. | 3 | 2 | 2 | .. | 67 |
| Cloth publisher's binding | 34 | 246 | .. | 2 | 13 | .. | .. | 295 |
| Spiral binding | .. | 1 | 1 | 1 | .. | .. | .. | 3 |
| Library-reinforced paperback | .. | 1 | .. | 9 | .. | .. | .. | 10 |
| Paper-covered boards | .. | 3 | .. | 0 | 1 | .. | .. | 4 |
| Pamphlet binding | .. | .. | .. | .. | 1 | 2 | .. | 3 |
| Leather binding | .. | 1 | .. | .. | 1 | .. | .. | 2 |
| Other | .. | 4 | .. | .. | 2 | .. | .. | 6 |
| No response | 7 | 35 | .. | 1 | 6 | .. | 1 | 50 |
| Total | 61 | 331 | 1 | 16 | 26 | 4 | 1 | 440 |

TABLE 6-d (2)

TYPE OF BINDING

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 279 | 63.5 |
| Incorrect | 111 | 25.2 |
| Null | 50 | 11.3 |
| Total | 440 | 100.0 |

TABLE 6-e

CONDITION

DISTRIBUTION OF RESPONSES

| Response | Actual Condition of Object Books | | | | | Total |
|---|---|---|---|---|---|---|
| | New | Fairly New | Used | Worn | Bad | |
| New | 23 | 18 | 11 | 4 | 3 | 59 |
| Fairly new | 19 | 38 | 52 | 13 | 15 | 137 |
| Used | 7 | 12 | 64 | 49 | 30 | 162 |
| Worn | 1 | 3 | 26 | 17 | 17 | 64 |
| Bad | .. | .. | .. | .. | 1 | 1 |
| No response | 1 | 5 | 6 | 5 | .. | 17 |
| Total | 51 | 76 | 159 | 88 | 66 | 440 |

CONDITION

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 143 | 32.2 |
| Incorrect | 280 | 63.6 |
| Null | 17 | 4.1 |
| Total | 440 | 100.0 |

TABLE 6-f

ILLUSTRATIONS

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Illustrations | No illustrations | |
| Illustrations | 77 | 22 | 99 |
| No illustrations | 34 | 174 | 208 |
| Don't know | 26 | 107 | 133 |
| Total | 137 | 303 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 251 | 57.1 |
| Incorrect | 56 | 12.7 |
| Null | 133 | 30.2 |
| Total | 440 | 100.0 |

TABLE 6-h (1)

HEIGHT[a]

DISTRIBUTION OF RESPONSES

| Response | Actual Height of Object Books | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | |
| 5 | 1 | .. | .. | 3 | .. | .. | .. | .. | .. | .. | 4 |
| 5½ | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0 |
| 6 | 2 | .. | 5 | 2 | 3 | .. | .. | .. | .. | .. | 12 |
| 6½ | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0 |
| 7 | 9 | 6 | 21 | 18 | 13 | .. | .. | .. | .. | .. | 67 |
| 7½ | .. | 1 | 2 | 4 | 1 | .. | .. | .. | .. | .. | 8 |
| 8 | 2 | 1 | 28 | 54 | 35 | 3 | .. | .. | .. | .. | 123 |
| 8½ | 1 | .. | 1 | 9 | 3 | .. | .. | .. | .. | .. | 14 |
| 9 | 1 | 2 | 8 | 26 | 30 | 8 | 3 | .. | .. | .. | 78 |
| 9½ | .. | .. | .. | 2 | 1 | 2 | 1 | .. | .. | .. | 6 |
| 10 | .. | .. | 1 | 6 | 10 | 4 | 6 | .. | .. | .. | 27 |
| 10½ | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0 |
| 11 | .. | .. | 2 | 3 | 4 | 2 | 5 | .. | 4 | .. | 20 |
| 11½ | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 1 |
| 12 | .. | .. | 1 | .. | 1 | 1 | 3 | .. | .. | .. | 6 |
| 14 | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | 1 |
| No response | 4 | 4 | 17 | 21 | 20 | 4 | 3 | .. | .. | .. | 73 |
| Total | 20 | 14 | 87 | 148 | 121 | 25 | 21 | .. | 4 | .. | 440 |

[a]Heights and responses are shown to the nearest one-half inch.

TABLE 6-h (2)

HEIGHT

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 96 | 21.8 |
| Incorrect | 307 | 69.8 |
| Null | 37 | 8.4 |
| Total | 440 | 100.0 |

TABLE 6-j (1)

NUMBER OF PAGES

DISTRIBUTION OF RESPONSES

| Response | Actual Number of Pages of Object Books | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-49 | 50-99 | 100-149 | 150-199 | 200-249 | 250-299 | 300-349 | 350-399 | 400-449 | 450-499 | 500-549 | 550+ | |
| 0-49 | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| 50-99 | 5 | 4 | 3 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 12 |
| 100-149 | 1 | 3 | 13 | 3 | 5 | 3 | .. | .. | .. | .. | .. | .. | 28 |
| 150-199 | .. | 4 | 10 | 9 | 11 | 7 | 5 | 3 | 3 | 1 | .. | .. | 53 |
| 200-249 | .. | .. | 7 | 13 | 20 | 15 | 8 | 4 | 5 | 1 | .. | 1 | 74 |
| 250-299 | .. | .. | 2 | 4 | 16 | 16 | 5 | 2 | 8 | 2 | 1 | 2 | 58 |
| 300-349 | .. | .. | 4 | 6 | 12 | 9 | 12 | 7 | 7 | 4 | 1 | 3 | 65 |
| 350-399 | .. | .. | .. | 4 | 5 | 6 | 7 | 5 | 8 | 4 | .. | .. | 39 |
| 400-449 | .. | .. | .. | 3 | 4 | 1 | 1 | 3 | 5 | 4 | .. | 3 | 24 |
| 450-499 | .. | .. | .. | .. | 1 | 2 | .. | 4 | 3 | 1 | .. | 3 | 14 |
| 500-549 | .. | .. | .. | .. | 1 | .. | 3 | .. | 5 | 3 | .. | 4 | 16 |
| 550+ | .. | .. | .. | .. | .. | .. | 1 | .. | 6 | 2 | .. | 9 | 18 |
| No response | 2 | .. | 5 | 3 | 4 | 6 | 4 | 4 | 6 | 1 | .. | 2 | 37 |
| Total | 10 | 11 | 44 | 45 | 79 | 65 | 46 | 32 | 56 | 23 | 2 | 27 | 440 |

TABLE 6-j (2)

NUMBER OF PAGES

SUMMARY OF RESPONSES

| Quality of Responses | Number | Percentage |
|---|---|---|
| Correct | 96 | 21.8 |
| Incorrect | 307 | 69.8 |
| Null | 37 | 8.4 |
| Total | 440 | 100.0 |

TABLE 7-a

POSITION IN BOOKSTACK

DISTRIBUTION OF RESPONSES

| Response | Actual Position of Object Book | | | Total |
|---|---|---|---|---|
| | High | Middle | Low | |
| High | 31 | 7 | 8 | 46 |
| Middle | 16 | 35 | 31 | 82 |
| Low | 3 | 8 | 26 | 37 |
| No response | 78 | 102 | 95 | 275 |
| Total | 128 | 152 | 160 | 440 |

POSITION IN BOOKSTACK

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 92 | 20.9 |
| Incorrect | 73 | 16.6 |
| Null | 275 | 62.5 |
| Total | 440 | 100.0 |

TABLE 7-b

POSITION ON SHELF

DISTRIBUTION OF RESPONSES

| Response | Actual Position of Object Book | | | Total |
|---|---|---|---|---|
| | Left | Middle | Right | |
| Left | 14 | 3 | 9 | 26 |
| Middle | 14 | 11 | 5 | 30 |
| Right | 10 | 6 | 17 | 33 |
| No response | 133 | 115 | 103 | 351 |
| Total | 171 | 135 | 134 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 42 | 9.5 |
| Incorrect | 47 | 10.7 |
| Null | 351 | 79.8 |
| Total | 440 | 100.0 |

TABLE 7-c

CALL NUMBER

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 17 | 3.9 |
| Incorrect | 6 | 1.3 |
| Null | 417 | 94.8 |
| Total | 440 | 100.0 |

TABLE 8-a (1)

DATE OF PUBLICATION

DISTRIBUTION OF RESPONSES

| Response | Actual Date of Publication of Object Books | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1960's | 1950's | 1940's | 1930's | 1920's | 1910's | 1900's | 1890's | Pre-1890 | Other | |
| 1960's | 50 | 16 | 3 | .. | .. | .. | .. | .. | .. | .. | 69 |
| 1950's | 37 | 40 | 19 | 12 | 1 | .. | .. | .. | .. | .. | 109 |
| 1940's | 6 | 15 | 16 | 10 | .. | .. | 2 | .. | .. | .. | 49 |
| 1930's | 1 | 10 | 6 | 17 | 6 | .. | 1 | 1 | .. | 1 | 43 |
| 1920's | 1 | 3 | 2 | 4 | 4 | 1 | .. | .. | .. | .. | 15 |
| 1910's | 1 | 1 | 3 | 1 | 1 | 3 | .. | 1 | .. | .. | 11 |
| 1900's | .. | 1 | .. | .. | .. | 1 | 1 | .. | .. | .. | 3 |
| 1890's | .. | .. | .. | 1 | .. | .. | .. | 1 | .. | .. | 2 |
| Pre-1890 | 1 | .. | .. | 3 | 1 | .. | .. | .. | 2 | 2 | 9 |
| Other | 5 | 2 | 1 | 1 | .. | 1 | 1 | .. | 1 | .. | 12 |
| No response | 34 | 40 | 26 | 10 | 4 | 2 | 1 | .. | .. | 1 | 118 |
| Total | 136 | 128 | 76 | 59 | 17 | 8 | 6 | 3 | 3 | 4 | 440 |

TABLE 8-a (2)

DATE OF PUBLICATION

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 134 | 30.4 |
| Incorrect | 188 | 42.8 |
| Null | 118 | 26.8 |
| Total | 440 | 100.0 |

TABLE 8-b

PUBLISHER

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 15 | 3.5 |
| Incorrect | 17 | 3.8 |
| Null | 408 | 92.7 |
| Total | 440 | 100.0 |

TABLE 8-c

TYPE OF PUBLISHER

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 40 | 9.1 |
| Incorrect | 40 | 9.1 |
| Null | 360 | 81.8 |
| Total | 440 | 100.0 |

TABLE 8-d

PLACE OF PUBLICATION

SUMMARY OF RESPONSES

| Quality of Responses | Number | Percentage |
|---|---|---|
| Correct | 29 | 6.6 |
| Incorrect | 72 | 16.4 |
| Null | 339 | 77.0 |
| Total | 440 | 100.0 |

TABLE 8-e

SERIES

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Series | Not a Series | |
| Series | 7 | 3 | 10 |
| Not a series | 7 | 44 | 51 |
| Null | 74 | 305 | 379 |
| Total | 88 | 352 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 51 | 11.6 |
| Incorrect | 10 | 2.3 |
| Null | 379 | 86.1 |
| Total | 440 | 100.0 |

TABLE 8-f

TRANSLATION

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Translation | Not a Translation | |
| Translation | 21 | 12 | 33 |
| Not a translation | 25 | 267 | 292 |
| Don't know | 14 | 101 | 115 |
| Total | 60 | 390 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 288 | 65.4 |
| Incorrect | 37 | 8.4 |
| Null | 115 | 26.2 |
| Total | 440 | 100.0 |

TABLE 8-g

REPRINT OR REVISION

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Reprinted or Revised Edition | Not Reprinted Or Revised Edition | |
| Reprinted or revised edition | 16 | 8 | 24 |
| Not reprinted or rev. | 32 | 183 | 215 |
| Don't know | 36 | 165 | 201 |
| Total | 84 | 356 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 199 | 45.2 |
| Incorrect | 40 | 9.1 |
| Null | 201 | 45.7 |
| Total | 440 | 100.0 |

TABLE 9-a

INDEX

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Index | No Index | |
| Index | 155 | 57 | 212 |
| No index | 50 | 37 | 87 |
| Don't know | 96 | 45 | 141 |
| Total | 301 | 139 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 192 | 43.6 |
| Incorrect | 107 | 24.4 |
| Null | 141 | 32.0 |
| Total | 440 | 100.0 |

TABLE 9-b

BIBLIOGRAPHY

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Bibliography | No Bibliography | |
| Bibliography | 76 | 66 | 142 |
| No bibliography | 42 | 66 | 108 |
| Don't know | 100 | 90 | 190 |
| Total | 218 | 222 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 142 | 32.3 |
| Incorrect | 108 | 24.5 |
| Null | 190 | 43.2 |
| Total | 440 | 100.0 |

TABLE 9-c

FOOTNOTES

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Footnotes | No Footnotes | |
| Footnotes | 122 | 29 | 151 |
| No footnotes | 79 | 59 | 138 |
| Don't know | 105 | 46 | 151 |
| Total | 306 | 134 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 181 | 41.1 |
| Incorrect | 108 | 24.6 |
| Null | 151 | 34.3 |
| Total | 440 | 100.0 |

TABLE 9-d

CHAPTER TITLES

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Chapter Titles | No Chapter Titles | |
| Chapter titles | 350 | 10 | 360 |
| No chapter titles | 22 | 7 | 29 |
| Don't know | 49 | 2 | 51 |
| Total | 421 | 19 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 357 | 81.1 |
| Incorrect | 32 | 7.3 |
| Null | 51 | 11.6 |
| Total | 440 | 100.0 |

TABLE 9-e

TABLES

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Tables | No Tables | |
| Tables | 48 | 24 | 72 |
| No tables | 43 | 213 | 256 |
| Don't know | 36 | 76 | 112 |
| Total | 127 | 313 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 261 | 59.3 |
| Incorrect | 67 | 15.2 |
| Null | 112 | 25.5 |
| Total | 440 | 100.0 |

TABLE 9-f

GRAPHS

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Graphs | No Graphs | |
| Graphs | 24 | 25 | 49 |
| No graphs | 25 | 243 | 268 |
| Don't know | 39 | 84 | 123 |
| Total | 88 | 352 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 267 | 60.7 |
| Incorrect | 50 | 11.3 |
| Null | 123 | 28.0 |
| Total | 440 | 100.0 |

TABLE 9-g

PROBLEMS

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Problems | No Problems | |
| Problems | 1 | 12 | 13 |
| No problems | 3 | 357 | 360 |
| Don't know | 2 | 65 | 67 |
| Total | 6 | 434 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 358 | 81.4 |
| Incorrect | 15 | 3.4 |
| Null | 67 | 15.2 |
| Total | 440 | 100.0 |

TABLE 9-h

CASE STUDIES

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Case Studies | No Case Studies | |
| Case studies | 119 | 70 | 189 |
| No case studies | 17 | 120 | 137 |
| Don't know | 30 | 84 | 114 |
| Total | 166 | 274 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 239 | 54.3 |
| Incorrect | 87 | 19.8 |
| Null | 114 | 25.9 |
| Total | 440 | 100.0 |

TABLE 9-i

GLOSSARY

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Glossary | No Glossary | |
| Glossary | 4 | 21 | 25 |
| No glossary | 7 | 240 | 247 |
| Don't know | 10 | 158 | 168 |
| Total | 21 | 419 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 244 | 55.4 |
| Incorrect | 28 | 6.4 |
| Null | 168 | 38.2 |
| Total | 440 | 100.0 |

TABLE 9-j

DEDICATION

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Dedication | No Dedication | |
| Dedication | 38 | 33 | 71 |
| No dedication | 17 | 41 | 58 |
| Don't know | 141 | 170 | 311 |
| Total | 196 | 244 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 79 | 17.9 |
| Incorrect | 50 | 11.4 |
| Null | 311 | 70.7 |
| Total | 440 | 100.0 |

TABLE 9-k

PREFACE

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Preface | No Preface | |
| Preface | 240 | 16 | 256 |
| No preface | 20 | 7 | 27 |
| Don't know | 143 | 14 | 157 |
| Total | 403 | 37 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 247 | 56.1 |
| Incorrect | 36 | 8.2 |
| Null | 157 | 35.7 |
| Total | 440 | 100.0 |

TABLE 9-l

QUOTATIONS

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Quotations | No Quotations | |
| Quotations | 52 | 32 | 84 |
| No quotations | 35 | 126 | 161 |
| Don't know | 55 | 140 | 195 |
| Total | 142 | 298 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 178 | 40.5 |
| Incorrect | 67 | 15.2 |
| Null | 195 | 44.3 |
| Total | 440 | 100.0 |

TABLE 9-m

FIGURES, CHARTS, DIAGRAMS

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Figures | No Figures | |
| Figures | 59 | 26 | 85 |
| No figures | 29 | 208 | 237 |
| Don't know | 48 | 70 | 118 |
| Total | 136 | 304 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 267 | 60.7 |
| Incorrect | 55 | 12.5 |
| Null | 118 | 26.8 |
| Total | 440 | 100.0 |

TABLE 9-n

SINGLE VOLUME

DISTRIBUTION OF RESPONSES

| Response | Actual Description of Book | | Total |
|---|---|---|---|
| | Single Volume | Part of Multi-volume Set | |
| Single volume | 411 | 2 | 413 |
| Part of multi-volume set | 9 | 8 | 17 |
| Don't know | 8 | 2 | 10 |
| Total | 428 | 12 | 440 |

SUMMARY OF RESPONSES

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 419 | 95.2 |
| Incorrect | 11 | 2.5 |
| Null | 10 | 2.3 |
| Total | 440 | 100.0 |

# APPENDIX C

## COMPARATIVE DATA FOR PSYCHOLOGY AND NON-PSYCHOLOGY EXPERIMENTEES

TABLE 1

AUTHOR

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 59 | 16.2 |
| Incorrect | 19 | 5.2 |
| Null | 286 | 78.6 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 11 | 14.5 |
| Incorrect | 3 | 3.9 |
| Null | 62 | 81.6 |
| Total | 76 | 100.0 |

TABLE 2

TITLE

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 79 | 21.7 |
| Incorrect | 219 | 60.1 |
| Null | 66 | 18.2 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 21 | 27.6 |
| Incorrect | 34 | 59.2 |
| Null | 10 | 13.2 |
| Total | 76 | 100.0 |

TABLE 3

TYPE OF WORK

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 173 | 47.4 |
| Incorrect | 186 | 51.2 |
| Null | 5 | 1.4 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 19 | 25.0 |
| Incorrect | 57 | 75.0 |
| Null | 0 | 0.0 |
| Total | 76 | 100.0 |

TABLE 4

LEVEL OF READER

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 190 | 52.3 |
| Incorrect | 170 | 46.8 |
| Null | 4 | .9 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 45 | 59.2 |
| Incorrect | 31 | 40.8 |
| Null | 0 | 0.0 |
| Total | 76 | 100.0 |

TABLE 5

SUBJECT DESCRIPTION

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 270 | 74.2 |
| Incorrect | 92 | 25.2 |
| Null | 2 | .6 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 63 | 82.9 |
| Incorrect | 13 | 17.1 |
| Null | 0 | 0.0 |
| Total | 76 | 100.0 |

TABLE 5a

SUBJECT HEADINGS[a]

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 98 | 70.0 |
| Incorrect | 37 | 26.4 |
| Null | 5 | 3.6 |
| Total | 140 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 38 | 73.1 |
| Incorrect | 14 | 26.9 |
| Null | 0 | 0.0 |
| Total | 52 | 100.0 |

[a]Responses from Subject Heading question (SH question).

TABLE 6a

COLOR

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 64 | 17.5 |
| Incorrect | 167 | 46.0 |
| Null | 133 | 36.5 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 19 | 25.0 |
| Incorrect | 28 | 36.8 |
| Null | 29 | 38.2 |
| Total | 76 | 100.0 |

TABLE 6b

LIGHT/DARK

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 131 | 36.0 |
| Incorrect | 77 | 21.0 |
| Null | 156 | 43.0 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 25 | 32.9 |
| Incorrect | 11 | 14.4 |
| Null | 40 | 52.7 |
| Total | 76 | 100.0 |

TABLE 6c

COVER DETAIL

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 54 | 14.8 |
| Incorrect | 51 | 14.0 |
| Null | 259 | 71.2 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 12 | 15.8 |
| Incorrect | 8 | 10.5 |
| Null | 56 | 73.7 |
| Total | 76 | 100.0 |

TABLE 6d

TYPE OF BINDING

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 234 | 64.3 |
| Incorrect | 97 | 26.7 |
| Null | 33 | 9.0 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 45 | 59.2 |
| Incorrect | 14 | 18.4 |
| Null | 17 | 22.4 |
| Total | 76 | 100.0 |

TABLE 6e (ie E)

CONDITION

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 108 | 29.6 |
| Incorrect | 240 | 66.0 |
| Null | 16 | 4.4 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 34 | 44.7 |
| Incorrect | 40 | 52.7 |
| Null | 2 | 2.6 |
| Total | 76 | 100.0 |

TABLE 6f

ILLUSTRATIONS

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 204 | 56.0 |
| Incorrect | 45 | 12.4 |
| Null | 115 | 31.6 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 47 | 61.8 |
| Incorrect | 11 | 14.5 |
| Null | 18 | 23.7 |
| Total | 76 | 100.0 |

TABLE 6h

SIZE

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 76 | 20.8 |
| Incorrect | 227 | 62.4 |
| Null | 61 | 16.8 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 13 | 17.2 |
| Incorrect | 51 | 67.0 |
| Null | 12 | 15.8 |
| Total | 76 | 100.0 |

TABLE 6j

NUMBER OF PAGES

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 77 | 21.1 |
| Incorrect | 253 | 69.5 |
| Null | 34 | 9.4 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 19 | 25.0 |
| Incorrect | 54 | 71.0 |
| Null | 3 | 4.0 |
| Total | 76 | 100.0 |

TABLE 7a

SHELF NUMBER

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 73 | 20.0 |
| Incorrect | 60 | 16.5 |
| Null | 231 | 63.5 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 19 | 25.0 |
| Incorrect | 13 | 17.1 |
| Null | 44 | 57.9 |
| Total | 76 | 100.0 |

TABLE 7b

SHELF POSITION

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 30 | 8.2 |
| Incorrect | 41 | 11.3 |
| Null | 293 | 80.5 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 12 | 15.8 |
| Incorrect | 6 | 7.9 |
| Null | 58 | 76.3 |
| Total | 76 | 100.0 |

TABLE 7c

CALL NUMBER

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 10 | 2.7 |
| Incorrect | 5 | 1.4 |
| Null | 349 | 95.9 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 7 | 9.2 |
| Incorrect | 1 | 1.3 |
| Null | 68 | 89.5 |
| Total | 76 | 100.0 |

TABLE 8a

DATE OF PUBLICATION

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 112 | 30.8 |
| Incorrect | 155 | 42.6 |
| Null | 97 | 26.6 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 22 | 29.0 |
| Incorrect | 33 | 43.4 |
| Null | 21 | 27.6 |
| Total | 76 | 100.0 |

TABLE 8b

PUBLISHER

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 15 | 4.1 |
| Incorrect | 16 | 4.4 |
| Null | 333 | 91.5 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 0 | 0.0 |
| Incorrect | 1 | 1.3 |
| Null | 75 | 98.7 |
| Total | 76 | 100.0 |

TABLE 8c

TYPE OF PUBLISHER

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 38 | 10.4 |
| Incorrect | 38 | 10.4 |
| Null | 288 | 79.2 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 2 | 2.6 |
| Incorrect | 2 | 2.6 |
| Null | 72 | 94.8 |
| Total | 76 | 100.0 |

TABLE 8d

PLACE OF PUBLICATION

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 27 | 7.4 |
| Incorrect | 68 | 18.6 |
| Null | 269 | 74.0 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 2 | 2.6 |
| Incorrect | 4 | 5.3 |
| Null | 70 | 92.1 |
| Total | 76 | 100.0 |

TABLE 8e

SERIES

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 48 | 13.1 |
| Incorrect | 7 | 1.9 |
| Null | 309 | 85.0 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 3 | 3.9 |
| Incorrect | 3 | 3.9 |
| Null | 70 | 92.2 |
| Total | 76 | 100.0 |

TABLE 8f

TRANSLATION

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 247 | 68.0 |
| Incorrect | 33 | 9.0 |
| Null | 84 | 23.0 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 41 | 53.9 |
| Incorrect | 4 | 5.3 |
| Null | 31 | 40.8 |
| Total | 76 | 100.0 |

TABLE 8g

REPRINT/REVISION

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 168 | 46.2 |
| Incorrect | 43 | 9.2 |
| Null | 162 | 44.6 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 31 | 40.8 |
| Incorrect | 6 | 7.9 |
| Null | 39 | 51.3 |
| Total | 76 | 100.0 |

TABLE 9a

INDEX

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 169 | 46.5 |
| Incorrect | 82 | 22.5 |
| Null | 113 | 31.0 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 23 | 30.3 |
| Incorrect | 25 | 32.9 |
| Null | 28 | 36.8 |
| Total | 76 | 100.0 |

TABLE 9b

BIBLIOGRAPHY

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 121 | 33.2 |
| Incorrect | 90 | 24.8 |
| Null | 153 | 42.0 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 21 | 27.6 |
| Incorrect | 18 | 23.7 |
| Null | 37 | 48.7 |
| Total | 76 | 100.0 |

TABLE 9c

FOOTNOTES

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 156 | 42.8 |
| Incorrect | 92 | 25.3 |
| Null | 116 | 31.9 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 25 | 32.9 |
| Incorrect | 16 | 21.1 |
| Null | 35 | 46.0 |
| Total | 76 | 100.0 |

TABLE 9d

CHAPTER TITLES

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 292 | 80.2 |
| Incorrect | 27 | 7.4 |
| Null | 45 | 12.4 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 65 | 85.5 |
| Incorrect | 5 | 6.6 |
| Null | 6 | 7.9 |
| Total | 76 | 100.0 |

TABLE 9e

TABLES

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 210 | 57.6 |
| Incorrect | 58 | 15.6 |
| Null | 96 | 26.4 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 51 | 67.1 |
| Incorrect | 9 | 11.8 |
| Null | 16 | 21.1 |
| Total | 76 | 100.0 |

TABLE 9f

GRAPHS

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 216 | 59.3 |
| Incorrect | 41 | 11.3 |
| Null | 107 | 29.4 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 51 | 67.1 |
| Incorrect | 9 | 11.8 |
| Null | 16 | 21.1 |
| Total | 76 | 100.0 |

TABLE 9g

PROBLEMS

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 287 | 78.9 |
| Incorrect | 13 | 3.5 |
| Null | 64 | 17.6 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 71 | 93.4 |
| Incorrect | 2 | 2.7 |
| Null | 3 | 3.9 |
| Total | 76 | 100.0 |

TABLE 9h

CASE STUDIES

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 199 | 54.7 |
| Incorrect | 73 | 20.0 |
| Null | 92 | 25.3 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 40 | 52.7 |
| Incorrect | 14 | 18.4 |
| Null | 22 | 28.9 |
| Total | 76 | 100.0 |

TABLE 9i

GLOSSARY

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 204 | 56.0 |
| Incorrect | 25 | 6.9 |
| Null | 135 | 37.1 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 40 | 52.6 |
| Incorrect | 3 | 4.0 |
| Null | 33 | 43.4 |
| Total | 76 | 100.0 |

TABLE 9j

DEDICATION

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 61 | 18.7 |
| Incorrect | 43 | 9.9 |
| Null | 260 | 71.4 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 18 | 23.7 |
| Incorrect | 7 | 9.2 |
| Null | 51 | 67.1 |
| Total | 76 | 100.0 |

TABLE 9k

PREFATORY MATERIAL

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 207 | 51.0 |
| Incorrect | 31 | 8.5 |
| Null | 126 | 34.5 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 40 | 52.6 |
| Incorrect | 5 | 6.6 |
| Null | 31 | 40.8 |
| Total | 76 | 100.0 |

TALBE 91

QUOTATIONS

SUMMARY OF RESPONSES

Non-Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 144 | 39.6 |
| Incorrect | 57 | 15.6 |
| Null | 163 | 44.8 |
| Total | 364 | 100.0 |

Psychology

| Quality of Response | Number | Percentage |
|---|---|---|
| Correct | 34 | 44.7 |
| Incorrect | 10 | 13.2 |
| Null | 32 | 42.1 |
| Total | 76 | 100.0 |

TABLE 9m

FIGURES

SUMMARY OF RESPONSES

| Non-Psychology | | | Psychology | | |
|---|---|---|---|---|---|
| Quality of Response | Number | Percentage | Quality of Response | Number | Percentage |
| Correct | 217 | 59.6 | Correct | 50 | 65.8 |
| Incorrect | 49 | 13.5 | Incorrect | 6 | 7.9 |
| Null | 98 | 26.9 | Null | 20 | 26.3 |
| Total | 364 | 100.0 | Total | 76 | 100.0 |

TABLE 9n

SINGLE VOLUME

SUMMARY OF RESPONSES

| Non-Psychology | | | Psychology | | |
|---|---|---|---|---|---|
| Quality of Response | Number | Percentage | Quality of Response | Number | Percentage |
| Correct | 344 | 94.5 | Correct | 75 | 98.7 |
| Incorrect | 11 | 3.0 | Incorrect | 0 | 0.0 |
| Null | 9 | 2.5 | Null | 1 | 1.3 |
| Total | 364 | 100.0 | Total | 76 | 100.0 |

# APPENDIX D

## DATA SUPPLEMENT TO "THE POTENTIAL USEFULNESS OF CATALOG ACCESS POINTS OTHER THAN AUTHOR, TITLE, AND SUBJECT"

TABLE 1a

DATA FROM MEMORY EXPERIMENT CONCERNING COLOR OF COVER

| Remembered Color of Cover | Actual Color of Cover | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue or Blue-Green | Brown or Tan | Orange | Grey | Black, Dark Grey, Blue, etc. | Red | White | Green | Purple or Violet | Yellow | Multicolored | |
| Blue or blue-green . . . . . | 13 | 1 | 1 | 1 | 6 | 4 | 0 | 3 | 0 | 1 | 6 | 36 |
| Brown or tan . . . | 4 | 6 | 2 | 1 | 4 | 16 | 0 | 3 | 2 | 1 | 5 | 44 |
| Orange . . . . . | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 2 | 5 |
| Grey . . . . . | 2 | 0 | 0 | 5 | 2 | 3 | 0 | 3 | 0 | 1 | 5 | 21 |
| Black, dark grey, dark blue, etc. | 20 | 4 | 0 | 3 | 17 | 12 | 0 | 3 | 1 | 2 | 14 | 76 |
| Red . . . . . | 7 | 2 | 1 | 0 | 2 | 23 | 0 | 2 | 0 | 0 | 5 | 42 |
| White . . . . . | 2 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 7 |
| Green . . . . . | 6 | 0 | 0 | 0 | 3 | 2 | 0 | 4 | 1 | 0 | 3 | 19 |
| Purple or violet . | 1 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 6 |
| Yellow . . . . . | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 7 | 1 | 10 |
| Multicolored . . . | 2 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 6 | 12 |
| No response . . . | 32 | 5 | 1 | 10 | 35 | 36 | 0 | 16 | 1 | 4 | 22 | 162 |
| Total . . . . | 90 | 19 | 5 | 21 | 71 | 104 | 0 | 35 | 7 | 17 | 71 | 440 |

TABLE 2a

DATA FROM MEMORY EXPERIMENT CONCERNING TYPE OF BINDING

| Remembered Type of Binding | Actual Type of Binding | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Library Binding or Rebinding | Cloth Publisher's Binding | Spiral Binding | Library Reinforced Paperback | Paper Covered Boards | Pamphlet Binding | Leather Binding | Other | |
| Library binding or rebinding . . . . . | 20 | 40 | 0 | 3 | 2 | 2 | 0 | 0 | 67 |
| Cloth publisher's binding . . . . . | 34 | 246 | 0 | 2 | 13 | 0 | 0 | 0 | 295 |
| Spiral binding . . . | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 3 |
| Library reinforced paperback . . . . . | 0 | 1 | 0 | 9 | 0 | 0 | 0 | 0 | 10 |
| Paper covered boards | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 4 |
| Pamphlet binding . . | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 3 |
| Leather binding . . . | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| Other . . . . . | 0 | 4 | 0 | 0 | 2 | 0 | 0 | 0 | 6 |
| No response . . . . . | 7 | 35 | 0 | 1 | 6 | 0 | 1 | 0 | 50 |
| Total . . . . . | 61 | 331 | 1 | 16 | 26 | 4 | 1 | 0 | 440 |

TABLE 2b

DATA FROM COLLECTION SAMPLES CONCERNING TYPE OF BINDING

| Kind of Sample | Type of Binding | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Library Binding or Rebinding | Cloth Publisher's Binding | Spiral Binding | Library Reinforced Paperback | Paper Covered Boards | Pamphlet Binding | Leather Binding | Other | |
| Holdings . . . . . | 34 | 63 | 0 | 1 | 7 | 20 | 0 | 0 | 125 |
| Usage . . . . . | 39 | 55 | 0 | 9 | 2 | 1 | 0 | 0 | 106 |

TABLE 3a

DATA FROM MEMORY EXPERIMENT CONCERNING HEIGHT

| Remembered Height in Inches | Actual Height in Inches | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | 5 3/4 or Less | 6- 6 3/4 | 7- 7 3/4 | 8- 8 3/4 | 9- 9 3/4 | 10- 10 3/4 | 11 or More | |
| 5 3/4 or less | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 4 |
| 6 - 6 3/4 . . | 0 | 0 | 2 | 7 | 3 | 0 | 0 | 12 |
| 7 - 7 3/4 . . | 0 | 0 | 16 | 45 | 14 | 0 | 0 | 75 |
| 8 - 8 3/4 . . | 0 | 0 | 4 | 92 | 41 | 0 | 0 | 137 |
| 9 - 9 3/4 . . | 0 | 0 | 3 | 36 | 41 | 4 | 0 | 84 |
| 10 - 10 3/4 . | 0 | 0 | 0 | 7 | 14 | 6 | 0 | 27 |
| 11 or more . | 0 | 0 | 0 | 7 | 9 | 8 | 4 | 28 |
| No response . | 0 | 0 | 8 | 38 | 24 | 3 | 0 | 73 |
| Total . . | 0 | 0 | 34 | 235 | 146 | 21 | 4 | 440 |

TABLE 3b

DATA FROM COLLECTION SAMPLES CONCERNING HEIGHT

| Kind of Sample | Height in Inches | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | 5 3/4 or Less | 6- 6 3/4 | 7- 7 3/4 | 8- 8 3/4 | 9- 9 3/4 | 10- 10 3/4 | 11 or More | |
| Holdings . . | 0 | 0 | 19 | 51 | 37 | 2 | 16 | 125 |
| Usage . . . | 1 | 1 | 13 | 47 | 40 | 1 | 3 | 106 |

TABLE 4a

DATA FROM MEMORY EXPERIMENT CONCERNING NUMBER OF PAGES

| Remembered Number of Pages in Book | Actual Number of Pages in Book | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | 0-99 | 100-199 | 200-299 | 300-399 | 400-499 | 500 or More | |
| 0-99 . . . . | 11 | 3 | 0 | 0 | 0 | 0 | 14 |
| 100-199 . . . | 8 | 35 | 26 | 8 | 4 | 0 | 81 |
| 200-299 . . . | 0 | 26 | 67 | 19 | 16 | 4 | 132 |
| 300-399 . . . | 0 | 14 | 32 | 31 | 23 | 4 | 104 |
| 400-499 . . . | 0 | 3 | 8 | 8 | 13 | 6 | 38 |
| 500 or more . | 0 | 0 | 1 | 4 | 16 | 13 | 34 |
| No response . | 2 | 8 | 10 | 8 | 7 | 2 | 37 |
| Total . . . | 21 | 89 | 144 | 78 | 79 | 29 | 440 |

TABLE 4b

DATA FROM COLLECTION SAMPLES CONCERNING NUMBER OF PAGES

| Kind of Sample | Number of Pages in Book | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | 0-99 | 100-199 | 200-299 | 300-399 | 400-499 | 500 or More | |
| Holdings . . . | 28 | 30 | 26 | 20 | 11 | 10 | 125 |
| Usage. . . . . | 2 | 21 | 34 | 19 | 15 | 15 | 106 |

TABLE 5a

DATA FROM MEMORY EXPERIMENT CONCERNING CONDITION

| Remembered Condition | Actual Condition | | | | | Total |
|---|---|---|---|---|---|---|
| | New | Fairly New | Used | Worn | Bad | |
| New . . . . . | 23 | 18 | 11 | 4 | 3 | 59 |
| Fairly new . . . | 19 | 38 | 52 | 13 | 15 | 137 |
| Used . . . . . | 7 | 12 | 64 | 49 | 30 | 162 |
| Worn . . . . . | 1 | 3 | 26 | 17 | 17 | 64 |
| Bad . . . . . | 0 | 0 | 0 | 0 | 1 | 1 |
| No response . . . | 1 | 5 | 6 | 5 | 0 | 17 |
| Total . . . | 51 | 76 | 159 | 88 | 66 | 440 |

TABLE 5b

DATA FROM COLLECTION SAMPLES CONCERNING CONDITION

| Kind of Sample | Condition | | | | | Total |
|---|---|---|---|---|---|---|
| | New | Fairly New | Used | Worn | Bad | |
| Holdings . . . . | 2 | 11 | 77 | 24 | 11 | 125 |
| Usage . . . . . | 13 | 23 | 50 | 16 | 4 | 106 |

TABLE 6a

DATA FROM MEMORY EXPERIMENT CONCERNING DATE OF PUBLICATION

| Remembered Date of Publication | Actual Date of Publication | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1960 and Later | 1950-1959 | 1940-1949 | 1930-1939 | 1920-1929 | 1910-1919 | 1900-1909 | 1890-1899 | 1889 and Before | Other | |
| 1960 and later . . | 50 | 16 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 69 |
| 1950-1959 . | 37 | 40 | 19 | 12 | 1 | 0 | 0 | 0 | 0 | 0 | 109 |
| 1940-1949 . | 6 | 15 | 16 | 10 | 0 | 0 | 2 | 0 | 0 | 0 | 49 |
| 1930-1939 . | 1 | 10 | 6 | 17 | 6 | 0 | 1 | 1 | 0 | 1 | 43 |
| 1920-1929 . | 1 | 3 | 2 | 4 | 4 | 1 | 0 | 0 | 0 | 0 | 15 |
| 1910-1919 . | 1 | 1 | 3 | 1 | 1 | 3 | 0 | 1 | 0 | 0 | 11 |
| 1900-1909 . | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 3 |
| 1890-1899 . | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| 1889 and before . | 1 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 2 | 2 | 9 |
| Other . . . | 5 | 2 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 12 |
| No response | 34 | 40 | 26 | 10 | 4 | 2 | 1 | 0 | 0 | 1 | 118 |
| Total . | 136 | 128 | 76 | 59 | 17 | 8 | 6 | 3 | 3 | 4 | 440 |

Data include non-year responses that were translated into years: e.g. (40's ⟶ 1945).

TABLE 6b

DATA FROM COLLECTION SAMPLES CONCERNING DATE OF PUBLICATION

| Kind of Sample | Date of Publication | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1960 and Later | 1950-1959 | 1940-1949 | 1930-1939 | 1920-1929 | 1910-1919 | 1900-1909 | 1890-1899 | 1889 and Before | Other | |
| Holdings . | 10 | 16 | 16 | 23 | 31 | 10 | 8 | 3 | 8 | 0 | 125 |
| Usage . . . | 40 | 25 | 13 | 14 | 3 | 3 | 0 | 1 | 4 | 3 | 106 |

TABLE 7a

DATA FROM MEMORY EXPERIMENT CONCERNING TYPE OF WORK

| Remembered Type of Work | Actual Type of Work | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Handbook | General Textbook | Introduction to a Subject | Monograph Covering a Single Aspect of a Field | Collection of Various Writings by One or a Number of Authors | Biography, Auto-biography, or Work Chiefly about a Person | History of Subject or Discipline | Self-improvement, Self-help, Self-understanding, etc. | Research Report | Report of a Single Case Study | Thesis or Dis-sertation | Other | Multi (2 or more) | |
| Handbook . . . . . | 1 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| General textbook . . . . . | 0 | 13 | 2 | 15 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 |
| Introduction to a subject . . . . . | 0 | 3 | 12 | 23 | 1 | 0 | 0 | 0 | | 0 | 0 | 0 | 2 | 46 |
| Monograph covering a single aspect of a field . . . . . | 0 | 1 | 4 | 35 | 3 | 0 | 1 | 4 | 3 | 1 | 0 | 1 | 1 | 54 |
| Collection of various writings by one or a number of authors . . | 1 | 0 | 0 | 4 | 20 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 1 | 30 |
| Biography, autobiography, or work chiefly about a person . . . . . | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 5 |
| History of a subject or discipline . | 0 | 0 | 0 | 9 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| Self-improvement, self-help, self-understanding, etc. . . . . | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 1 | 14 |
| Research report . . . . . | 0 | 1 | 1 | 14 | 0 | 0 | 0 | 0 | 14 | 1 | 1 | 0 | 4 | 36 |
| Report of a single case study . . . | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 3 |
| Thesis or dissertation . . . . . | 0 | 0 | 1 | 11 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 1 | 17 |
| Other . . . . . | 0 | 1 | 1 | 37 | 4 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 46 |
| Multi (2 or more) . . . . . | 0 | 16 | 10 | 58 | 21 | 6 | 2 | 3 | 11 | 0 | 2 | 0 | 4 | 133 |
| No response . . . . . | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |
| Total . . . . . | 2 | 40 | 33 | 214 | 56 | 6 | 4 | 16 | 37 | 6 | 6 | 4 | 16 | 440 |

TABLE 7b

DATA FROM COLLECTION SAMPLES CONCERNING TYPE OF WORK

| Kind of Sample | Actual Type of Work | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Handbook | General Textbook | Introduction to a Subject | Monograph Covering a Single Aspect of a Field | Collection of Various Writings by One or a Number of Authors | Biography, Auto-biography, or Work Chiefly about a Person | History of Subject or Discipline | Self-improvement, Self-help, Self-understanding, etc. | Research Report | Report of a Single Case Study | Thesis or Dis-sertation | Other | Multi (2 or more) | |
| Holdings . . . . . | 4 | 14 | 13 | 21 | 11 | 2 | 6 | 3 | 16 | 1 | 30 | 4 | 0 | 125 |
| Usage . . . . . | 3 | 5 | 7 | 37 | 26 | 3 | 7 | 1 | 8 | 2 | 4 | 3 | 0 | 106 |

TABLE 8a

DATA FROM MEMORY EXPERIMENT CONCERNING LEVEL OF READERS FOR WHICH INTENDED

| Remembered Level | Actual Level | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Popularization | Treatment Understandable to the Generally Educated Layman | Work for Beginning College Students | Work for Advanced Students or Professionals | More than One of the Above | Other | |
| Popularization . . . . . | 12 | 34 | 2 | 4 | 0 | 0 | 52 |
| Treatment understandable to the generally educated layman . . . | 5 | 56 | 11 | 57 | 0 | 0 | 129 |
| Work for beginning college students . . . | 0 | 15 | 4 | 21 | 0 | 0 | 40 |
| Work for advanced students or professionals . . . . . | 0 | 6 | 10 | 88 | 0 | 0 | 104 |
| More than one of the above . . . . . | 5 | 39 | 12 | 49 | 0 | 0 | 105 |
| Other . . . . . | 0 | 2 | 0 | 4 | 0 | 0 | 6 |
| No response . . . . . | 0 | 0 | 1 | 3 | 0 | 0 | 4 |
| Total . . . . . | 22 | 152 | 40 | 226 | 0 | 0 | 440 |

TABLE 8b

DATA FROM COLLECTION SAMPLES CONCERNING LEVEL OF READERS FOR WHICH INTENDED

| Kind of Sample | Level | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Popularization | Treatment Under-standable to the Generally Educated Layman | Work for Beginning College Students | Work for Advanced Students or Professionals | More than One of the Above | Other | |
| Holdings . . . . . | 7 | 28 | 32 | 58 | 0 | 0 | 125 |
| Usage . . . . . | 0 | 19 | 46 | 41 | 0 | 0 | 106 |

TABLE 9a

DATA FROM MEMORY EXPERIMENT CONCERNING INDEX

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Index Present | Index Absent | |
| Index present . . . | 155 | 57 | 212 |
| Index absent . . . | 50 | 37 | 87 |
| No response . . . . | 96 | 45 | 141 |
| Total . . . . | 301 | 139 | 440 |

TABLE 9b

DATA FROM COLLECTION SAMPLES CONCERNING INDEX

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Index Present | Index Absent | |
| Holdings . . . . . | 57 | 68 | 125 |
| Usage . . . . . | 73 | 33 | 106 |

TABLE 10a

DATA FROM MEMORY EXPERIMENT CONCERNING TABLES

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Tables Present | Tables Absent | |
| Tables present . . . | 48 | 24 | 72 |
| Tables absent . . . | 43 | 213 | 256 |
| No response . . . . | 36 | 76 | 112 |
| Total . . . . . | 127 | 313 | 440 |

TABLE 10b

DATA FROM COLLECTION SAMPLES CONCERNING TABLES

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Tables Present | Tables Absent | |
| Holdings . . . . . | 56 | 69 | 125 |
| Usage . . . . . | 35 | 71 | 106 |

TABLE 11a

DATA FROM MEMORY EXPERIMENT CONCERNING FIGURES, CHARTS, AND DIAGRAMS

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Figures, Charts, or Diagrams Present | Figures Charts, or Diagrams Absent | |
| Figures, charts, or diagrams present . . . . | 59 | 26 | 85 |
| Figures, charts, or diagrams absent . . . . | 29 | 208 | 237 |
| No response . . . . . | 48 | 70 | 118 |
| Total . . . . . | 136 | 304 | 440 |

TABLE 11b

DATA FROM COLLECTION SAMPLES CONCERNING FIGURES, CHARTS, AND DIAGRAMS

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Figures, Charts, or Diagrams Present | Figures, Charts or Diagrams Absent | |
| Holdings . . . . . | 43 | 82 | 125 |
| Usage . . . . . | 36 | 70 | 106 |

TABLE 12a

DATA FROM MEMORY EXPERIMENT CONCERNING CHAPTER TITLES

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Chapter Titles Present | Chapter Titles Absent | |
| Chapter titles present . | 350 | 10 | 360 |
| Chapter titles absent . | 22 | 7 | 29 |
| No response . . . . . | 49 | 2 | 51 |
| Total . . . . . | 421 | 19 | 440 |

TABLE 12b

DATA FROM COLLECTION SAMPLES CONCERNING CHAPTER TITLES

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Chapter Titles Present | Chapter Titles Absent | |
| Holdings . . . . . | 89 | 36 | 125 |
| Usage . . . . . | 93 | 13 | 106 |

TABLE 13a

DATA FROM MEMORY EXPERIMENT CONCERNING
QUOTATIONS FROM LITERARY WORKS

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Quotations Present | Quotations Absent | |
| Quotations present . . | 52 | 32 | 84 |
| Quotations absent . . | 35 | 126 | 161 |
| No response . . . . . | 55 | 140 | 195 |
| Total . . . . . | 142 | 298 | 440 |

TABLE 13b

DATA FROM COLLECTION SAMPLES CONCERNING
QUOTATIONS FROM LITERARY WORKS

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Quotations Present | Quotations Absent | |
| Holdings . . . . . | 40 | 85 | 125 |
| Usage . . . . . | 52 | 54 | 106 |

TABLE 14a

DATA FROM MEMORY EXPERIMENT CONCERNING CASE STUDIES

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Case Studies Present | Case Studies Absent | |
| Case studies present . . | 119 | 70 | 189 |
| Case studies absent . . | 17 | 120 | 137 |
| No response . . . . . | 30 | 84 | 114 |
| Total . . . . . | 166 | 274 | 440 |

TABLE 14b

DATA FROM COLLECTION SAMPLES CONCERNING CASE STUDIES

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Case Studies Present | Case Studies Absent | |
| Holdings . . . . . | 27 | 98 | 125 |
| Usage . . . . . | 25 | 81 | 106 |

TABLE 15a

DATA FROM MEMORY EXPERIMENT CONCERNING GRAPHS

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Graphs Present | Graphs Absent | |
| Graphs present . . . . | 24 | 25 | 49 |
| Graphs absent . . . . | 25 | 243 | 268 |
| No response . . . . . | 39 | 84 | 123 |
| Total . . . . . | 88 | 352 | 440 |

TABLE 15b

DATA FROM COLLECTION SAMPLES CONCERNING GRAPHS

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Graphs Present | Graphs Absent | |
| Holdings . . . . . | 37 | 88 | 125 |
| Usage . . . . . | 20 | 86 | 106 |

TABLE 16a

DATA FROM MEMORY EXPERIMENT CONCERNING PREFATORY MATERIAL

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Preface Present | Preface Absent | |
| Preface present . . . | 240 | 16 | 256 |
| Preface absent . . . | 20 | 7 | 27 |
| No response . . . . . | 143 | 14 | 157 |
| Total . . . . . | 403 | 37 | 440 |

TABLE 16b

DATA FROM COLLECTION SAMPLES CONCERNING PREFATORY MATERIAL

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Preface Present | Preface Absent | |
| Holdings . . . . . | 87 | 38 | 125 |
| Usage . . . . . | 84 | 22 | 106 |

TABLE 17a

DATA FROM MEMORY EXPERIMENT CONCERNING FOOTNOTES

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Footnotes Present | Footnotes Absent | |
| Footnotes present . . | 122 | 29 | 151 |
| Footnotes absent . . | 79 | 59 | 138 |
| No response . . . . . | 105 | 46 | 151 |
| Total . . . . . | 306 | 134 | 440 |

TABLE 17b

DATA FROM COLLECTION SAMPLES CONCERNING FOOTNOTES

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Footnotes Present | Footnotes Absent | |
| Holding . . . . . | 75 | 50 | 125 |
| Usage . . . . . | 69 | 37 | 106 |

TABLE 18a

DATA FROM MEMORY EXPERIMENT CONCERNING
BIBLIOGRAPHY OR SUGGESTED READINGS

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Bibliography Present | Bibliography Absent | |
| Bibliography present . | 76 | 66 | 142 |
| Bibliography absent . | 42 | 66 | 108 |
| No response . . . . . | 100 | 90 | 190 |
| Total . . . . . | 218 | 222 | 440 |

TABLE 18b

DATA FROM COLLECTION SAMPLES CONCERNING
BIBLIOGRAPHY OR SUGGESTED READINGS

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Bibliography Present | Bibliography Absent | |
| Holdings . . . . . | 64 | 61 | 125 |
| Usage . . . . . | 61 | 45 | 106 |

TABLE 19a

DATA FROM MEMORY EXPERIMENT CONCERNING DEDICATION

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Dedication Present | Dedication Absent | |
| Dedication present . . | 38 | 33 | 71 |
| Dedication absent . . | 17 | 41 | 58 |
| No response . . . . . | 141 | 170 | 311 |
| Total . . . . . | 196 | 244 | 440 |

TABLE 19b

DATA FROM COLLECTION SAMPLES CONCERNING DEDICATION

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Dedication Present | Dedication Absent | |
| Holdings . . . . . | 29 | 96 | 125 |
| Usage . . . . . | 27 | 79 | 106 |

TABLE 20a

DATA FROM MEMORY EXPERIMENT CONCERNING GLOSSARY

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Glossary Present | Glossary Absent | |
| Glossary present . . . | 4 | 21 | 25 |
| Glossary absent . . . | 7 | 240 | 247 |
| No response . . . . . | 10 | 158 | 168 |
| Total . . . . . | 21 | 419 | 440 |

TABLE 20b

DATA FROM COLLECTION SAMPLES CONCERNING *GLOSSARY*

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Glossary Present | Glossary Absent | |
| Holdings . . . . . | 4 | 121 | 125 |
| Usage . . . . . | 7 | 99 | 106 |

TABLE 21a

DATA FROM MEMORY EXPERIMENT CONCERNING PROBLEMS AT ENDS OF CHAPTERS

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Problems Present | Problems Absent | |
| Problems present . . . | 1 | 12 | 13 |
| Problems absent . . . | 3 | 357 | 360 |
| No response . . . . . | 2 | 65 | 67 |
| Total . . . . . | 6 | 434 | 440 |

TABLE 21b

DATA FROM COLLECTION SAMPLES CONCERNING PROBLEMS AT ENDS OF CHAPTERS

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Problems Present | Problems Absent | |
| Holdings . . . . . | 4 | 121 | 125 |
| Usage . . . . . | 2 | 104 | 106 |

TABLE 22a

DATA FROM MEMORY EXPERIMENT CONCERNING SINGLE-VOLUME WORKS

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Single-Volume Work | Not a Single-Volume Work | |
| Single-volume work . . | 411 | 2 | 413 |
| Not a single-volume work . . . . . | 9 | 8 | 17 |
| No response . . . . . | 8 | 2 | 10 |
| Total . . . . . | 428 | 12 | 440 |

TABLE 22b

DATA FROM COLLECTION SAMPLES CONCERNING SINGLE-VOLUME WORKS

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Single-Volume Work | Not a Single-Volume Work | |
| Holdings . . . . . | 121 | 4 | 125 |
| Usage . . . . . | 100 | 6 | 106 |

TABLE 23a

DATA FROM MEMORY EXPERIMENT CONCERNING TRANSLATED WORKS

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Translated Work | Not a Transalted Work | |
| Translated work . . . | 21 | 12 | 33 |
| Not a translated work . . . . . | 25 | 267 | 292 |
| No response . . . . . | 14 | 101 | 115 |
| Total . . . . . | 60 | 380 | 440 |

TABLE 23b

DATA FROM COLLECTION SAMPLES CONCERNING TRANSLATED WORKS

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Translated Work | Not a Translated Work | |
| Holdings . . . . . | 12 | 113 | 125 |
| Usage . . . . . | 20 | 86 | 106 |

TABLE 24a

DATA FROM MEMORY EXPERIMENT CONCERNING
REPRINTED OR REVISED WORKS

| Remembered Property | Actual Property | | Total |
|---|---|---|---|
| | Reprinted or Revised | Not Reprinted or Revised | |
| Reprinted or revised . | 16 | 8 | 24 |
| Not reprinted or revised . . . . . | 32 | 183 | 215 |
| No response . . . . . | 36 | 165 | 201 |
| Total . . . . . | 84 | 356 | 440 |

TABLE 24b

DATA FROM COLLECTION SAMPLES CONCERNING
REPRINTED OR REVISED WORKS

| Kind of Sample | Property | | Total |
|---|---|---|---|
| | Reprinted or Revised | Not Reprinted or Revised | |
| Holdings . . . . . | 17 | 108 | 125 |
| Usage . . . . . | 13 | 93 | 106 |